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PROCEEDINGS

NOVEMBER 16 - 18, 1982

INTERSERVICE/INDUSTRY TRAINING EQUIPMENT CONFERENCE

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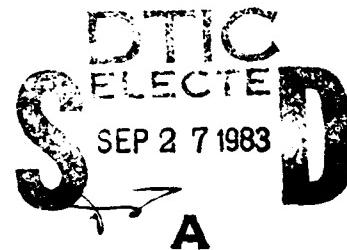
NATIONAL SECURITY INDUSTRIAL ASSOCIATION

PROCEEDINGS OF THE

FOURTH INTERSERVICE/INDUSTRY

TRAINING EQUIPMENT CONFERENCE

Conference Chairman:

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Training and Control Systems Operations
Honeywell, Inc.

Hyatt-Orlando
Kissimmee, Florida

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NOVEMBER 16, 1982

OPENING SESSION

Dr. James A. Gardner

Good morning. I'm Jim Gardner, Conference Chairman, and it's my pleasure to welcome you to the Fourth Interservice/Industry Training Equipment Conference. As you've probably noticed by now, interest and support of training is rapidly growing. Three years ago when this hotel was reserved, the Conference was expected to attract about 800 participants and about a dozen or so exhibits. We now expect as many as 1,500 attendees and over 50 exhibits. Why this growth? Well, I believe to a large extent it is due to the fact that the training equipment field is maturing. We're getting better at our jobs and the benefits of proper training are becoming universally recognized. Now, not only is flight simulation regarded as highly cost effective, but a wide range of simulation-based training is considered to have a high pay-off. New technologies, such as microcircuit design, new architectures, technologies and displays, and instructional techniques have permitted rapid advances in training device applications. Just as important has been the recognition of the need to evaluate and, where possible, quantify the effectiveness, or you might say, the return on investment of these devices.

Over the next three days, you will hear technical, management, and user papers describing the current state-of-the-art in training. Ralph Davis and his Program Committee have done an excellent job of preparing the program covering a wide range of topics and interests. Panel discussions will allow you to hear a variety of government and industry viewpoints. In addition, you may have already seen the many excellent exhibits filling every corner of the Hyatt.

The emphasis of this year's Conference is on the user; but who is the user? Is he the classroom instructor or is he the student? Maybe he's the crew chief on the flight line. Just maybe he's the battalion commander. What I'm really saying is there's more than one user and we plan to hear many viewpoints to better understand user problems and needs.

The purpose of this Conference is to promote communications between government and industry. This objective cannot be fully met if you hesitate to ask questions or refrain from expressing your own problems or views. Please be candid. Please. We welcome your ideas.

I hope you'll both enjoy your stay at the Hyatt and carry home a better understanding, a better recognition of training problems, but also, hopefully, you'll carry home better solutions to be applied in the coming year.

At this time I'd like to introduce Mr. Paul A. Watson, Manager of Advanced Programs at Hughes Aircraft Company and Vice Chairman of the Logistics Management Committee of the National Security Industrial Association. Mr. Watson brings with him more than 26 years' experience in supervising and managing both customer and company training programs. As Vice Chairman of the Logistics Management Committee of the National Security Industrial Association, he coordinates a variety of government and industry functions, including training. Mr. Watson.

Mr. Paul A. Watson

Thanks, Jim. Good morning, ladies and gentlemen. This spot on your program was to have been filled by Lieutenant General Wallace Robinson, President of the National Security Industrial Association. General Robinson had been looking forward to joining all of us here since early last spring. However, illness in his immediate family -- in fact, both his mother and his father -- prevented his leaving the Washington area for this particular week. Now, in his stead, but with equal or greater feeling, it is truly my pleasure to welcome you on behalf of the Chairman of the Board of the National Security Industrial Association to this, the Fourth Interservice/Industry Training Equipment Conference.

Since many of our assemblage here may only have a limited acquaintance with NSIA, let me use this brief spot to discuss some of the history and background highlights of the Association. For the past 38 years, this Association has played a vital role in bringing industry and government together in the interest of national security. Created in 1944 at the request of James Forrestal, then Secretary of the Navy and later our first Secretary of Defense, the Association has promoted and provided an environment for effective two-way communications between industry and government in matters relating mainly to resources aspects of our national security. It now consists of more than 310 American industrial and research organizations, large and small, representing all segments of the U.S. industry from all parts of the United States. NSIA functions mainly through a structure of standing committees covering such disciplines as research and engineering; procurement; quality and reliability assurance; anti-submarine warfare; Command, Control, and Communications Committee; Legislative Information Committee; Energy Committee; Software Committee; and, of course, the Logistics Management Committee. These committees continually communicate with and provide advice and technical assistance to the Government, especially the Department of Defense, either on request or on the Association's own initiative.

In close coordination with our committee activities, the standing committee activities, we have the NSIA program of national activities. This embraces professional symposia, conferences, industry briefings, and visits to defense installations. The conference

here in Orlando this week is a national activities event, although it is sponsored by and in close coordination with the Personnel and Training Group of the Logistics Management Committee. NSIA feels that the need for mutual discussions between government and industry continues to grow and will become even more critical in the future if we are to develop and maintain the industrial base for support of the readiness and sustainability of the nation's forces.

It was in this light of mutually beneficial discussion that a dialogue was begun between some of us in industry through NSIA sponsorship and the Interservice Training Equipment Steering Committee. Those initial discussions took place a little over four years ago. For that first Interservice/Industry Training Equipment Conference, the U.S. Navy was the lead service and also was sponsor of all the activities, while we of NSIA ran alongside trying to pick up the cadence. It was fitting that the U.S. Navy should be the total leaders of that first Interservice/Industry Training Equipment Conference, since they had been conducting the Navy Training Equipment Conference for 12 to 13 years prior to that time.

For the second Interservice/Industry Training Equipment Conference, NSIA was the sponsoring industrial association while the U.S. Air Force was the leader of the Interservice Steering Committee.

For the third Interservice/Industry Training Equipment Conference, the U.S. Army was the Interservice leader and since it had been decided to alternate the sponsoring industry associations, the American Defense Preparedness Association was the host.

The conclusion to that line of reasoning shows that this, the fourth Interservice/Industry Training Equipment Conference, with the U.S. Navy and Marine Corps as the leaders of the Interservice Steering Committee and NSIA as host, gentlemen and ladies, this conference has been built by journeymen. If we look at the topics and the august array of speakers and the knowledgeable audience that you look around and view, it appears that everything is prepared to meet the objectives stated in your program in a most effective and productive fashion. Again, on behalf of NSIA, let me welcome each of you to this conference and turn the proceedings back to Jim Gardner.

Dr. Gardner

Thank you, Paul. I am now pleased to introduce the Executive Chairman of this conference, Captain John T. McHugh. Prior to assuming command of the Naval Training Equipment Center in June of 1980, Captain McHugh held a variety of positions with the Navy, ranging from piloting F-3, F-4, and F-14 aircraft to managing F-4 and F-14 training programs. Through aircraft production and flight test assignments, he developed his skills at managing programs, skills well known by us in industry. A national leader in the development and application of training systems, Captain Jack McHugh.

Captain John T. McHugh

Good morning, ladies and gentlemen. I'm happy to be here and I hope you're happy to be here, also. I'd like to add to Jim's welcome to the Fourth Interservice/Industry Conference on Training Devices. I'd like to also indicate that I'd like to join with the other services, who you'll hear speak directly after me, Colonel Don Campbell, Program Manager for Training Devices for the United States Army; Colonel Tom Honeywill, the SIMSPO in Dayton, Ohio; and Colonel Al Castellana, representing the Marine Corps here in Orlando, Florida.

I'm certain, from knowing all the events that are planned, that this Conference is destined to be one of the most successful and probably one of the most memorable ones we'll see. To stress what Jim says, we are highlighting this year three special subjects: technology, management, and above all, the user. You'll see that we have user panels scheduled for today and four scheduled for tomorrow, and I feel, from my point of view here in Orlando, somewhat remote from the Navy, that I'm very interested to hear what the Navy and the Air Force and Army user views are on the products we're turning out, and I hope that you're just as interested in hearing their views and trying to figure out where they want us to be directing our efforts in the future.

But before I go into my introduction, I'd like to hesitate just for a moment and pay a special tribute to the NSIA and Paul Watson, Phil Cole, and, of course, the Chairman, Jim Gardner, for the planning and the effort that they've done in pulling this together. It's certainly no easy chore. It's been going on for several years now, and the last year has been very intensive in pulling this program together as successfully as they have. I'd like to just give them a round of applause because they've done a tremendous job. As well, I'd like to recognize the Naval Training Center in Orlando. Admiral Hardington's group provided the colors for this morning's presentation and also the music that was available to us for the opening ceremonies. So please, a round of applause for the Naval Training Center, Orlando. I wish they were here to enjoy that because they're a proud young group of people over there and we see a lot of nice young lads and young ladies going through the Naval Training Center every day and keep supporting the Fleet, and it's a constant pipeline and one that you'd be proud of in seeing their performance over there on a daily basis.

Ladies and gentlemen, it is my very special pleasure today to introduce our keynote speaker. Admiral Williams is really the Navy's number one businessman. He's the man in charge of acquisition for the entire United States Navy. He's a professional and the kind of person that we'd all like to emulate. Admiral Williams really doesn't need any long introduction. Initially assigned to a 'estroyer and also several submarines, he's commanded three submarines and the nuclear powered submarine USS DANIEL WEBSTER. He's commanded the Submarine Squadron Sixteen and Submarine Group Five.

He has served in many prestigious offices and positions, particu-
larly in the Office of the Chief of Naval Operations and also in
the Pacific Fleet. His last position, just prior to assuming his
job in June of 1981, was the Deputy Chief of Naval Operations for
Submarine Warfare. Ladies and gentlemen, without any further ado,
I'd like to present our Chief of Naval Material, Admiral John G.
Williams, Jr., United States Navy.

Admiral John G. Williams, Jr.

Thank you very much. Good morning, ladies and gentlemen. The
Navy is pleased to be your host at this fourth conference and I
am pleased to be able to be the first one to have an opportunity
to talk to you. I can tell you that you will have a good confer-
ence because any conference that emulates the Japanese -- the
Japanese run their trains right on time; you started your confer-
ence sharply at 8:30 -- is bound to be a success. Also, I noticed
that in Navy tradition, we had some coffee out front, but better
to get you awake, we had the Navy Band in here and with about 10
or 15 minutes of sterling music, I'm sure that even in the far cor-
ners, you are awake and ready to go.

I would like to pick up on two of the points that Jim Gardner
made. First, he said that he wanted a frank and open exchange and
I believe that is critical towards having a good symposium here.
Second, in case you missed what the true meaning of the first 5
minutes of his introduction really meant, it said to all of you
that there is money to be made in the training equipment business.
And then one observation that I thought you might be interested in,
and that is that although Captain McHugh may feel that he is a
little bit remote from the Navy, being down here in the Orlando
area, I have solved that problem for him and as we get into the
year 1983, he will receive a set of orders to come on up to the
headquarters of the Navy Material Command, come right into Washing-
ton, D.C., right into Crystal City, get right into the program
managership business, and I can guarantee you, he will not feel
remote at all.

I haven't had a chance to meet too many of you, but as I look
out at the sea of faces and guess the composition of the audience,
it is obvious to me that the Services and industry have recognized
the importance of establishing a strong interrelationship between
the producer and the user, and for my money, that is the way it
should be because we are all aiming at the same target -- the
development and fielding of the most effective weapon systems to
meet the threat in the most cost effective manner.

So I would like to start this morning with a view of a little
bit of the bigger picture and tell you that from my view, our
challenge in the Navy today is one of how to deal with our most
likely adversary, the Soviet Union. Today, they have more ships
than we do; they are out-building us in the surface ship area by
a ratio of 2:1 and in the submarine building program by a ratio

of 5:1. It is true, they do not have the carriers nor naval air that we have, nor do they have the amphibious lift capability that we have. So our challenge is to increase the number of naval forces, keep a technology lead, and improve the readiness of our present day forces. We have established our priorities in order to do this. Our first priority goes to our people. That is, to take care of the health and the welfare of the men and women of the United States Navy. Our second priority goes to maintaining the readiness of the forces that exist today, and then our third priority goes to building up our forces, our so-called 600-ship Navy. Everything that we do is consistent with these three priorities. This fourth annual conference is involved with all three of those priorities -- people, readiness, and new products.

From the Material community perspective, we increasingly recognize the importance of operational readiness. Specifically, hardware that is reliable and maintainable so that when combined with well-trained personnel, we will achieve the full design potential and have the best mission support. Our ultimate goal is customer satisfaction and the customer that we aim to please is the user of the training hardware that you people are developing.

Is our customer satisfied? That's the question. And in my view, the answer is not to the degree that we would like him to be satisfied.

Much has been stated and printed about our acquisition management principles and objectives, as we all strive to achieve our primary goals of improved readiness and force building. We must continually reemphasize the relationship between weapons systems acquisition process and the training planning process. To satisfy an operational requirement, we must develop affordable and cost effective training options for each of the alternative hardware designs. This requires trade-off analyses of the manpower, personnel, and training resource requirements for the training concepts for each of the alternatives. To achieve affordability and cost effective training in an environment of increasing limited resources, it is essential to identify as early as possible all factors affecting the life cycle supportability, including technical hardware descriptions, reliability thresholds, operational and maintenance concepts, maintainability, and test and evaluation objectives. The early identification of these data allows for the development of related manning and training concepts and subsequently provides for the development and implementation of effective and efficient training programs and training support. Once determined, we must also realize that the lead time necessary to program for and acquire the required manpower and training resources to formulate and establish the training program, and to train and detail the necessary personnel is normally equivalent to the same lead time required for the development, procurement, and installation in the Fleet of the new material to be supported. Therefore, total training resources that are necessary to establish initial and follow-on training capability

must be incorporated in the training, programming, and budgeting process early during hardware development, and must be made increasingly definitive as the development progresses. More simply stated, the user wants and must have the most efficient, cost effective training system possible and it must be available and completely operational in time to train the very first operational unit.

In order to do this, we must utilize the systems approach to define and document firm, realistic requirements; closely track the weapon systems development; successfully compete for the required resources in what we all know today is a limited or constrained fiscal environment; ensure that we have continuing communication and coordination among all the involved communities -- operational, material, training. We must work within the framework of current Department of Defense guidance whereby we have been told to streamline the acquisition process, encourage competitive procurement, better control our software, and improve reliability and maintainability.

There are numerous planning groups that have been established to effect improvements in the requirements identification, tracking, and approval process. For example, in the surface and submarine communities, they have developed an effective means to satisfy the requirement through their surface warfare training group and for the submarine community, in their submarine trainer working group respectively. In each of these groups, as well as in an aviation group, the Naval Training Equipment Center here plays a major role. The Navy Training Equipment Center provides research, development, engineering, tests, evaluation, procurement, fabrication, maintenance, alteration, conversion, repair, overhaul, and logistics for training devices equipment and assigned training materials. When you think about that, that's pretty much from cradle to grave. In addition, the Center also provides research development, engineering and procurement assistance to the Army Project Manager for Training Devices, and it has liaison officers from both the Marine Corps and the U. S. Air Force attached to the Command. The Navy Training Equipment Center's experience in training devices runs the gamut from silhouette target devices for small arms practice to sophisticated flight simulators for complex attack and fighter aircraft, surface combat systems team trainers, and support for the TRIDENT program.

As weapons systems increase in complexity, so do their associated training devices. The Center has been able to support the increase in number and complexity of these devices and they have introduced some innovative management techniques that have resulted in increased employee productivity. It is also interesting to note that the Center is actively involved in foreign military sales, FMS. Through the FMS program, the Center has provided exceptional service to assist over 50 foreign governments in the determination and procurement of their training material and equipment needs. This support consists of providing professional and technical services in training devices under multi-year FMS cases valued at

more than $200 million. In addition, the Center provides surveillance over the FMS program for all training material for activities within the Training Command.

Unique within this foreign military sales effort is the support given to the Saudi Arabian Naval Expansion program. The Center is providing a multi-million dollar turnkey operation for the Navy Training Facility at Jubail in Saudi Arabia. . . . . . and in CONUS, major training systems have been developed, tested, shipped, installed, and ultimately will be turned over to the Saudi Arabian Government.

In the field of training, training devices, equipment, and facilities, the Center is a valuable asset and provides a most beneficial service to the entire Department of Defense.

As we emphasize readiness, it is necessary to discuss the people part of the readiness equation. Our requirements for skilled manpower remain a critical and crucial concern. Retaining high skilled technicians, trained at considerable expense, has been a problem with all of the Services. Moreover, it appears that the pool of people that the Services can draw from will continue to shrink over the next 20 years. At the same time, we can expect an increasingly competitive market for these highly skilled people. To operate and maintain a more complex military force, we will require, then, continued leadership emphasis and maybe some special incentives to encourage more personnel to stay in the critical skill assignments. Though we are working the problem and we have made some improvements, I believe we can expect some shortfalls in our senior technical ranks.

If we can design and field systems that are simpler to operate and maintain, we will reduce, then, the severity of the people problem and still maintain high readiness. This is an area where using current generation technology, in my view, we have only had a few successes. The computer age technology explosion is certainly an area that we must all better understand and more fully exploit. I believe it is a real key to making equipments more simple to operate and maintain. We continue to see the need to increase industry's role in taking better advantage of the computer technology and to help us in the maintenance and reliability area. It is clear that the application of current technology to improve weapons systems performance is moving at a much faster pace than those which would improve training and support. Think -- such capabilities as day-night vision, laser target designators, multiple tracking of targets, stabilized fire control systems were not even available 15 years ago, and today they are common in the U.S. weapons systems.

Complex equipment, I believe, is becoming easier to operate, but we still pay a high price for this capability. To maintain these systems, we use large mobile automatic test equipment and large support tails. This is a serious burden to the United States Navy, which is charged with long, sustained operations at sea and a rapid

deployment type of operation. Comparable improvements in training and support technology are essential if we want to have our military systems operational with the kind of people we expect in the military service over the next 20 years. The Florida State Board of Regents recently approved the establishment of an institute for simulation and training. This action should greatly improve the collegiate, government, and industry relationships and enhance the field of simulation technology.

Training technology, with applications specifically for maintenance, is another area that requires our attention. Widely available instructional devices, trainers, and simulators are needed to provide the repetitive practice necessary to develop troubleshooting and maintenance skills. Some of the technologists that I've talked to tell me that they believe we are on the verge of an era which could make such devices and simulators widely used and economically available.

In summary, as you start your fourth conference, my views are that we need to better control our operating and support costs, reduce our manpower skill requirements, and thus achieve a higher level of readiness. There is a severe demand for weapons systems design with high mission reliability and low maintenance requirements. We need to more fully exploit the newest techniques and the latest technology to produce the best possible training and training support devices and simulators. We need to do a better job in our training planning process. We can no longer afford to simply continue to buy several more copies of the weapon system to solve a problem. I suggest that we involve the user, the Fleet, much more as we establish our requirements. We need to more fully exploit the computer technologies.

Now, these items that I've just touched on are but a few of the training and training support opportunities that are needed. In the next few days during your three-day conference here, you will see and hear many fine ideas proposed by both government and industry and I know they are worthy of your pursuit. Therefore, I wish you much success during your fourth annual conference. Thank you.

Dr. Gardner

Thank you, Admiral Williams.

His comments, I think, were very appropriate in pointing out to some of us that our jobs are not just the devices; there's a much larger system involved and we often overlook the complexities of the task we are currently involved in. I thank you for pointing that out and I thank you for pointing out some of the problems we have, the deficiencies we need to work on, and I hope we will carry those forward throughout the next three days and identify those, and perhaps the solutions to some of those or at least strive towards the solutions through the next few days.

At this time, I would like to introduce Colonel Thomas W. Honeywill, Deputy for Simulators of the Aeronautical Systems Division at Wright-Patterson Air Force Base. Colonel Honeywill has held a variety of positions throughout his career, including production, procurement, and as Director of ASD's EF-111 Tactical Jamming System Program Office, and recently as ASD's Chief of Staff. He is a command pilot with nearly 9,000 hours flying time, with military decorations, including the Bronze Star, the Meritorious Service Medal, Air Medal, and the Air Force Commendation Medal. May I now introduce Colonel Tom Honeywill.

Colonel Thomas W. Honeywill

That's the best introduction I've ever had, I think. This morning I'm pleased to have the honor to introduce our Department of Defense user speaker, Lieutenant General Dean Tice. General Tice entered the Army as an enlisted man in April of 1946 and one year later was commissioned as a Second Lieutenant of Infantry. Throughout his long and distinguished career, he has served in many key command positions that without question qualify him to present the user view to us this morning. Some of those positions are Deputy Brigade Commander; Battalion Commander; Brigade Commander; Chief of Staff, Infantry Division; and Infantry Division Commander. Additionally, General Tice has served in a number of increasingly important personnel and training positions, culminating in his present position as Deputy Assistant Secretary of Defense for Military Personnel and Force Management. General Tice is responsible for policy and program management for a multitude of personnel-related functions in the Department of Defense, but most important to us, he is the OSD Manager of Training. He will talk to us this morning on technology in support of unit training. Ladies and gentlemen, Lieutenant General Dean Tice.

Lieutenant General R. Dean Tice

Thank you, Tom. It's great to be here. I arrived last night and was met by a couple of distinguished gentlemen from Hughes, and I said, "Is this Saturday evening?" They said, "No, General Tice, you obviously are kind of screwed up. This is Monday evening." I'm so used to appearing in public and around the country only on Saturdays and Sundays, I am extremely privileged to come down here during the week.

The reason I tell you that is within the Office of the Secretary of Defense and the MRA&L -- Manpower Reserve Affairs and Logistics -- there are seven deputies, and I'm the only military deputy there. The others are either political appointees or career civil servants. And sometimes that arena becomes very lonely when you wear the uniform. But I found out after I was there about five months why they have one military deputy in MRA&L. My wife said, "Dean, you know we've been here back from Europe after five years over there and you haven't been home for a weekend in five months." It seems that they keep the one military deputy there

who represents the Secretary of Defense and the Assistant Secretary of
Defense, and sometimes the President, to speak on Saturdays and Sun-
days, so you understand why I am so pleased to be here during the
week.

I have to tell you one war story. You know, the real privilege
also of being a soldier with almost 37 years of service is that you
have the option of telling war stories, and if you haven't served,
you really don't know what we're talking about. The great benefit
of having the number of years' service that I have, you can improve
them, you can modify them, you can embellish them, and after you've
told them enough times, you begin to believe that you actually did it.
But perhaps the best thing is the opportunity of running into some-
body that would refute it is few and far between. But I must say
here today, I don't dare do that, because I've seen Pat Roudy, Paul
Pearson, and Gene Key, and great soldiers that I've served with for
the last 20 to 30 years and they're in the audience, so I must be
careful. But I will tell you one story to give you an impression of
what I think is happening in our country today. When there was a
turn-around -- except if you read the decision by the judge this morn-
ing, that turn-around may not be complete with our nation and it's
attitude towards military service. Late one Friday night, Robin
Perry, who was the Assistant Secretary then, called me and said, "Hey,
Dean, I have a requirement to go over and speak at the Hyatt Washington
tomorrow night and something has come up. I have to go out of town.
Will you go do it for me?" (The next night was Saturday, of course.)
I said, "Surely, I will do that. What is it all about?" He said,
"It's a bunch of college students in town and they want to have some
kind of discussion about registration and the draft." Now, this is
the weekend after the three-judge panel in Philadelphia ruled that
registration was unconstitutional because it did not include women.
I arrived over there and we were supposed to go on the air at 9
o'clock, and Dr. Bernard Roster met me, who is the Director of Selec-
tive Service, and he said, "Dean, my God, am I glad to see you. We
have a formal debate tonight." I said, "You're putting me on." He
said, "No, the moderator is the editor of People magazine." I said,
"What do you want me to cover?" He said, "Oh, hell, Dean -- all you
have to do is go up there and tell them how in the first 180 days of
war we have to bring 600,000 people into the armed forces." I told
him I thought I could handle that and I got up and gave my 5 minutes,
sat down, and the moderator called then on Barry Lynn and he gave
his diatribe that he's used for the last 20 years. So I felt pretty
good until the constitutional lawyer got up and he walked behind the
podium and said, "I want all of you students out there to take a
look over to my left," and he pointed to me. I didn't know whether
I'd lost my uniform or something like that. He said, "They're liars,
they're cheats, they're frauds. They're here tonight being paid by
the Government to talk about the merits of registration and the draft.
Me? I'm here because I'm concerned about your constitutional rights."
Now, there are 2,000 students representing 285 universities in the
audience. He said, "Look at that general -- all he wants you for is
cannon fodder." Well, I got up and started to deck him, but Dr.
Roster said, "No, Dean. That's not the way we debate." Believe me,

when midnight came, I didn't think it would ever end, but I felt
good about that and that was 2-1/2 years ago. When the evening
ended, I guess if we had taken a vote among those 2,000 college
students, probably 70 percent went away feeling pretty good about
what we had to say, and the 30 percent were fairly negative. From
that day on, I've noticed as I speak around the country -- including
representing the President, of all places, in Westchester, Massachu-
setts two months ago to rededicate the Medal of Honor to a Civil War
veteran who received it 30 years late in a paper bag, by the name
of Private Eddy who was with the Tenth Massachusetts. On that week-
end -- that was a Sunday, by the way -- we had about a three-hour
parade, the total town population was less than 1,000. The press
conference was set up in the mortuary -- one of three buildings in
the town -- but I came away feeling good. Twenty-one Medal of Honor
winners showed up and we rededicated the medal to the granddaughter
of Private Eddy.

I've now been in my job a little over three years and I'm be-
ginning to be worried because I will have 37 years in the United
States Army come next April, and I have just completed so far the
longest tour in my whole Army career. Now, the only reason I'm
fearful, there was a guy named Peter who wrote a book about guys
who tended to stagnate in those positions, so you can see why I
have some concern. But I feel awfully good about being in this
purple-suited business, because I come from a family that, as I saw
the Navy band this morning and the Navy honor guard, I was recalling
the memories of my father, who today is 86 and still lives on a farm
out in Kansas and decided to retire last year, not because of health
but just because he said he was getting too old. I lost my mother
several years ago and Dad served in the Navy in 1917 to 1919. I
have six brothers. We all served from 1940 on, and I have one
brother now who is a Major General, who is the Adjutant General of
Kansas, and of course, I was fortunate enough to be in the current
position, but in 1976, after having been overseas -- and Dad lives
alone on that farm -- four or five of the boys got together to try
to put back together the kind of decay that sets in on the farm.
There had been an old cottonwood tree that went through the barn
roof, and the septic tank was stopped up, and the laterals were
overflowing, and since I had helped Dad years ago put that in, he
said, "Dean, you might go out there and work in the outhouse." So
I was doing that. At that time, I was a Major General and my
brother was a Brigadier General, and he was up on the barn roof.
A neighbor came over and said, "How are things going today?" And
Dad reared back and said, "Pretty darn good. I have a Brigadier
General up on the barn roof fixing the hole there and I've got a
Major General working in the outhouse. That's not bad for a Seaman
First Class."

It really is a pleasure to be here today and I'm fortunate
enough to be able to spend the rest of the day with you and some
of tomorrow. I hope to get to know many of you from the industry
side better, and, of course, to renew the acquaintances from those
of us who still serve either in mufti or in uniform with very

responsible jobs and challenges about how we can train better. You know, I need hardly mention that high quality training is indispensable to military readiness. But in my role, as I look and see that we're acquiring more material and equipment, I am disturbed a little bit when I see that the readiness does not increase in the same ratio of the procurement of equipment. I think the . . . ingredient of that equation so that we can ever get a one-for-one return probably occurs in the training area. The recent combat actions in the South Atlantic and Lebanon have demonstrated once again for anyone so short-sighted as to have forgotten that well-trained forces are very likely to win in battle, and that poorly-trained forces will lose.

The role of training technology, good training has never been cheap or easy to conduct. The clear trend is for good training to get more expensive and more difficult. The role of training technology, as I see it, is to provide the means to improve the quality of training while keeping it affordable.

I realize that I'm preaching to the choir when I emphasize the importance of training technology to this group. Nonetheless, I think it is appropriate to highlight this presentation by quoting from the report of the just-completed Defense Science Board Summer Study on Training and Training Technology.

This slide says, "We believe that without supplementary investments in new training devices and methods, we simply cannot maintain the level of individual and unit performance demanded by modern high technology warfare." I believe that all of those present will heartily subscribe to this view of the central role of technology in raising our capacity to train well. But this enthusiasm for putting technology to work has to be tempered by a sense of the finite nature of our resources. Since resources are by no means unlimited, we have to set priorities and put the resources where we can expect the best pay-offs.

You know, we have done relatively well in using technology to improve sensory conducted individual training at our training centers, whether they are flight simulators and things like that. Although it will always be necessary to press for even greater improvements there, somewhat less attention has been paid to the use of technology to improve training in operational units. I believe we should consider placing higher priority on using technology to support this type of training.

Someone asked me recently what kind of progress has been made in this type of training. I said, "Well, I'm not sure, but I think I have a story for you that kind of gives you an indication about this progress. It involves two businessmen, Mike and Harry, who were going to the Canadian wilds to hunt moose. They rented one of these bush pilot planes out of Chicago and flew up there and landed on a lake. The plane had pontoons and the pilot said, as he dropped off Mike and Harry, 'I'll be back to pick you up next week. But look, you're going to have to choose up which one of you will bring a moose back. There's no way that I can haul two moose

on this aircraft; it just won't handle it.' They shrugged and went off into the woods and a week later the pilot landed and sure enough, there at the edge of the lake were two monstrous moose, one weighing about 1200 pounds and the other about 800, and two happy hunters. He taxied over and said, 'Okay, come on aboard, but you can't bring both of those moose onboard this aircraft.' They said, 'Aw, come on -- last year the pilot we had gave us that stuff, but he finally agreed to take on the two moose with us.' All you have to do is tell a pilot that some other pilot did it and you get a challenge, so the pilot said okay. They dragged those moose on, backed out into the lake, reved up and took off, and almost cleared the trees and crashed. Mike came to and he looked over at Harry and said, 'Where are we, Harry?' And Harry looked around and said, 'We're about 200 yards further than we were last year.'"

I kind of feel that way about training technology in units after having commanded the Third Infantry Division for a couple of years in Europe, and that's why I've chosen the topic here. When I speak of units, I'm referring to operational teams of all types and sizes -- air crews, squads, companies, squadrons, ships, crews, sections, and work centers. You know, unit commanders have a tough training job. They are responsible for the training and the progressive development of each member of their unit, as well as the collective training of their units and their subordinate units and team skills. And we all know that there is something unique about those who wear a uniform, no matter what Service. If there ever was a mathematical formula that was correct, it is that the sum of the whole in a well-trained fighting unit always exceeds the sum of the parts.

Now, this adds up to a really formidable task and one that must be carried out under conditions that are frequently not conducive to good training. Let me make some observations about individual training in operational units. There has always been controversy about the proper division of the training function between the train-ing commands who train individuals and units. This, of course, re-mains a live issue today, but it is not necessarily relevant to the objective of improving individual training in units. Most of you will agree that the greater part of in-depth, lasting learning takes place after a Service member joins a unit and puts what has been learned in school to work in a real military job. Leaders really don't learn to lead until they have to perform in leadership posi-tions. Similarly, mechanics and other types of skilled personnel gain most of their expertise through supervised work and training at the job site. Consequently, regardless of the quality or length of formal school training, we must have comprehensive programs in units to assure that the learning process continues.

There are two main advantages to conducting individual training at the job and in the units. The learner can concentrate on the exact type of equipment that is found in the unit of assignment and can learn within the context of that particular unit's mission. This tends to eliminate over-generalized and extraneous instruction. Membership in a unit encourages a stronger learning effort from peer pressure. The supervisor wants the trainee to learn so he or she

can help with the workload and the trainee wants to learn in order to
become a productive member of the team.   Consequently, other things
being equal, individual training in a unit is likely to be more ef-
fective than an additional amount beyond some minimum of school
training.   However, other things are seldom equal in real life.
There are obstacles to productive individual training in units that
offset the advantages previously discussed.   These obstacles vary
a great deal in their effects among Services and among the type of
units.   But they are seldom wholly absent from any unit.   Lack of
time due to requirements for mission-related activities; collective
training; and in some cases, housekeeping duties that have little
real training value associated with the mission.   Lack of dedicated
instructors.   Supervisors seldom have the time to teach their subordi-
nates as thoroughly as would be desirable and simultaneously do a
proper job as supervisors of work that must be done.   Lastly, lack
of training devices that have the capabilities of devices commonly
found in Service training commands.

These disadvantages have been tempered to a considerable extent
in the Navy, Marine Corps, and Air Force aviation units by use of
dedicated training detachments that provide supplemental local train-
ing to maintenance personnel.   Elsewhere, the disadvantages inherent
to unit training tend to dominate, weakening individual training in
units.

What are some of the obstacles to good collective training?
The most restrictive obstacle to satisfactory results is the lack
of suitable space to carry out the kind of training that truly pre-
pares a unit for its wartime mission.   Now, here I am speaking of
land, sea, air space for live fire and unrestricted maneuver.   With
all of my European experience, this is particularly magnified there,
because I could not fire the VULCAN . . . except once a year when
they would load everybody up and take them down to Crete.   You can-
not maneuver an entire division and fire any live ammunition any-
where in Europe.   We've had to go in and completely level . . .
Germany and rearrange it in order to fire the M-1 tank.   These are
the kinds of challenges that a unit commander is faced with because
of the lack of space.   You say there is plenty of air space there.
. . . . .   The Army has tried to overcome this with the National
Training Center at Fort Irwin, where they can get some live fire
training and by use of simulation devices, really introduce some
realism in training.

There will always be a realism gap between training for war
and the stark actualities of combat.   But actions can be taken to
close the gap to some extent and any gain in realism has the
potential for providing significant gains in the readiness of the
force.

Now, I would just mention here some special problems of the
Guard and Reserve, because there is no way that we can go to any
major engagement without fully activating our Reserve components.

The current Administration has made that commitment, unlike what we had in the past with our involvement in Vietnam. Unit commanders in the Reserve components share the same training problems as their active force counterparts. The main difference is that the problems in the Reserve components are even more restrictive -- even less space and considerably less time for training, and frequently, less adequate resources. Some Reserve units also have special problems beyond those they have in common with active units. For example, most Army Reserve maintenance units that maintain tanks work routinely with M-48s and some M-60 series. After mobilization, however, they would be maintaining M-60 series and M-1 tanks, despite the fact that they have only limited opportunities to become proficient on these tanks.

Now, how can technology really help? To sum it up, unit commanders, in addition to multiple problems in operational requirements, maintenance, discipline, and so on, have serious training problems as well as those we just mentioned. Now, these commanders need help and I'm convinced that technology can be a large part of that solution. However, let me emphasize first that leaders -- the users of operational units -- can do a great deal to improve the state of training within the bounds of the limited resources that are already available to them. And I would caution this group when you talk about the user -- and I know that John will talk a little bit about their options in DARCOM -- unless you go out there and get the leadership onboard, nothing will really ever happen in the military hierarchy. And you just surely have to understand that. All experienced military people know of situations where training opportunities among similar units are equal, but the state of training in some units is very good and in other units, it is poor. Nine times out of ten the difference is in the degree of emphasis that commanders place on training and the degree that they involve themselves personally in training. It is possible to go through the motions on training -- boring holes through the sky, shooting, and maneuvering -- without really advancing the state of readiness in any significant way. In other cases, a leader may accomplish a great deal by assuring that all training is purposeful; that the maximum learning value is extracted from every round of ammunition fired and every maneuver event. Think the cost of a TOW missile of around $4,000 and figure out how many rounds you can shoot each year with the number of TOW gunners that we have in the United States Army. There has to be some options available to us that will give us the simulation equal to that live firing.

I would just say that good leaders will also make full use of the training devices that technology produces for them. Poor leaders are more apt to let them gather dust in the supply rooms. Technology can't make up for derelictions among leaders, but certainly, senior leaders can.

What then can technology do to help in unit training? I will suggest some directions for you here today. The first is training

for leaders. Leaders themselves and their staffs need training and exercise in their wartime functions. You know, with the computer we have made quantum improvements in the ability to war game and give real life challenges to the commanders in the decision process. The prior schooling they will have had provides a good foundation and unit exercises will continue to be of great value in developing their skills. The remaining gap is a shortage of training exercises that are not constrained by limitations on maneuver or resources and that can be made fully relevant to the geography and other institutional factors that match likely wartime conditions.

Considerable progress has been made along this line through computer-based war gaming, as I mentioned. The recent development of small portable and relatively inexpensive data processors opens up new possibilities. It may be entirely feasible to provide every unit commander access to facilities that will enable him and his staff to take regular workouts in the planning and the simulated execution of wartime tasks. It is hard to think of any action that would have greater potential for raising the readiness of our forces.

Training for trainers. Training subordinate personnel in their duties is a highly important responsibility of leaders, but it is only one of the multitude of supervisory duties. The Services have all recognized this problem and have developed a plethora of documents and aids to improve the ability and productivity of the leader as trainer. In some cases, the mass of material may be so large as to swamp the unit trainer. Training the trainer will continue to be a vital task and we must continually review what has been done to see if there are better ways to do it.

Training of maintenance personnel. The trend in new, more capable weapons and equipment seems, in many cases, to simplify the learning tasks for operators but complicated for the people who must do the maintenance. Certainly we don't want to slacken efforts to provide capable training devices for operators; however, it seems to me that we can get an equally important pay-off from an effort at least as great to develop and use capable devices to train maintainers. I was at Fort Knox two weeks ago talking to Lou Wagner and the phenomena has occurred with the M-1 tank in the organizational maintenance training requirements, when they showed the training weeks on the slide for me, I said, "It takes you longer to train to automotive skills than it does to fire control and turret mechanics. Something is wrong." After all, that fire control system and that turret is very complex. He said, "No, wait a minute. When we introduced that turbine in there, the harnesses and everything are so complex that at the organizational level, we have had to increase the training time over the M-60A3 and the M-60 on the automotive side to two weeks." It was interesting, though, when I went to Aberdeen in the direct support maintenance, when you come to that level the reverse takes place. You have to have more highly trained and qualified technicians to do that kind of support maintenance at the higher level.

The next one -- on-site training devices. The greatest success in simulation has been in developing devices for use in training commands and other centralized settings. Now, this is not necessarily wrong. If one had to choose whether to provide simulators for the school system or the field, the schools would usually deserve first priority. However, providing simulators to the field should not be far behind in priority. It is important to resist the temptation to economize by sliding simulation at the job site where it can be used effectively in conjunction with school-acquired learning to improve the level of unit performance. As I said previously, there are a number of advantages to training at the job site and our simulator acquisition strategy should reinforce those advantages. In general, we have followed such a strategy in acquiring simulators for air crew training, but we have lagged in producing capable simulators for operators of systems other than aircraft and for maintenance personnel on almost all systems.

Next, the devices that enhance training performed on primary equipment. One promising way to provide more simulation to the field is to use the primary equipment itself, with suitable augmenting instrumentation as the simulator. In considering this approach, we have to be careful not to induce possible safety hazards or to teach the soldier, the sailor, the marine, or the airman some habits that are not good in combat. We also have to be careful not to tie up equipment, such as aircraft, that is needed for non-simulation training. Within these constraints, however, there are many new systems that have integral components which can fulfill many functions that have in the past been performed by separate simulators. It is feasible to design portable modules using microprocessors that can be plugged into the primary system -- and you'll see some of them here -- to create capable simulators. By this method, it may be possible to avoid some of the costs associated with conventional simulators which are useful only for training. Alternatively, it may be possible, in fact, to create several simulators for the cost of one, and thus multiply the number of people that can be trained. And if the simulation circuitry can be built into the major equipment item at the factory at reasonable cost, I say so much the better.

Technology to enhance collective training experience -- most of you are aware of the Army's development of the advance maneuver capability that I mentioned at the National Training Center at Fort Irwin, California. Among other features, the NTC uses the Miles Laser Engagement System and a comprehensive position locating system. During force-on-force maneuvers, players learn immediately the effect of their own and the enemy's fire. The location system records by computer where on the ground each player is throughout the engagement. There is an unqualified need for programs that produce similar results in terms of realism in other fields of tactical training. I urge each of you to turn your ingenuity towards ways to expand the realism of collective training.

Next, I'd like to mention solving training problems for the Reserves that I mentioned earlier. Training problems tend to be much the same, but exacerbated in the Reserve components than in the active forces. Simulation in almost all of its forms is ideal for Reserve training, particularly when it is used to overcome the problems of the lack of space and time. The special conditions of training in the Reserves must be at the forefront of our minds when we consider the use of technology in training.

Measuring training effectiveness -- finally, your help is needed to help us find better ways to measure the effectiveness of training. I am aware that a lot of analytical talent has been applied to this problem and that more application is planned. I regret that I am also aware that we have a long way to go. Since we can only crudely measure training effectiveness, we are on shaky ground in justifying expenditures for the fruits of training technology. Will a device or a technique double training effectiveness? Increase it by one-half? How much training time does it save? If we are talking about big investment -- and we usually are -- does the improvement justify the price? You know, it is not enough just to assert the training value of a device; the guardians of our purse strings quite properly want positive evidence, not just assertions. And I have two recommendations for those who would sell training devices to the Department of Defense. I suggest that you should put a major effort into designing ways to demonstrate objectively the training value of new training devices. This will not only make the device more attractive to us, but it will also make it more likely that the device will be used up to the capacity when it has been fielded.

Secondly, I think you should avoid embellishments that drive up the price without commensurate pay-off or gains in training effectiveness. It may not be worth the price, for example, to design a simulator that replicates all features of the simulated equipment. Some lesser degree of replication may do the job equally as well.

Now, I guess I would close by giving you just a short look toward the future. In the context of the issues I have been discussing, what can we foresee in the future? First, good training, as always, will have the capability of multiplying force readiness, but good training will become even more difficult to attain as we introduce the more complex weapons systems. Training in units -- that is, in the main battle force -- is not as good now as it should be or could be. The application of technology can do much to improve the situation, for technology has already opened new vistas of training effectiveness and it can open more.

One of the areas that I work in -- I work with the National Association of Mathematics Professors and other technical areas to try to promote in this country of ours a greater expenditure and a greater involvement and commitment for people in the scientific

and engineering areas. Recently, a Japanese economist came by and we were talking with him, and he pointed out to me that in 1955, only 17 percent of the patents on electronic technology were granted to foreigners, either with American-based locations or the foreigners in their own right asking for patent authority in this country. Last year, 55 percent of the patent grants in the electronic technology was granted to foreign nationals or representing foreign firms. He said, "We turn out 10 engineers for every lawyer. In your country, you turn out 7 lawyers for every engineer. Now, I must say to you Americans, obviously you are more interested in dividing the pie up rather than making the pie larger." I think there's a lot of truth to that and I think that industry, in conjunction with the Department of Defense, has a mission to try to improve the communications to excite our young people today to undertake some of the hard science skills in their higher levels of education.

The challenge to us all, then, is to put all available technology to work to make training and readiness better. The knowledgeable people gathered at this conference have among you the ability to meet this challenge, and we ask your help. Thank you very much.

Dr. Gardner

Thank you, General Tice. We've been issued a challenge. If you look at your programs, many of the topics identified are in the sessions in the next two or three days. I think it's our responsibility to try to answer that challenge.

I'd like to now introduce Colonel Donald M. Campbell, Project Manager for Training Devices. Colonel Campbell has held a wide range of assignments throughout his career, including Commander of mechanized and artillery units, and prior to his current assignment, held the positions of Chief, Office of Resources and Management Analysis and Executive Officer to the Deputy Commanding General at DARCOM. Let me introduce Colonel Don Campbell.

Colonel Donald M. Campbell

Ladies and gentlemen, it's a great privilege this morning to be able to introduce to you the Army speaker. Mr. John Blanchard is the Principal Deputy to the Deputy Commanding General for Research, Development, and Acquisition, DARCOM Headquarters. He is well known to most of you folks out here in the civilian community because he has been interested in defense-related activities of NSIA, ADPA, NASA, Contract Management Association, and many other of the things that are related to our business. He has held a variety of assignments since starting with the Navy way back when, and we won't even go back to that. You can read that in the brochure. He's been out in the private sector; he's been very interested in the activities of training up through material acquisition and into DARCOM Headquarters in 1972. He has held jobs of ever-increasing responsibility in that headquarters, but we know him best as the father of PM TRADE. He was there when we started back in 1974, and I guess if there are a couple of ex-PMs out here in the

audience, they'll recall like I do how many times we sat up there in our reviews and he said, "When are you going to get it to the troops?" The thing he's really interested in is when we're going to get it in the hands of the troops. That's my challenge and that's what he's going to talk about today. So without any further ado, I'd like to introduce Mr. John Blanchard.

Mr. John D. Blanchard

Thank you very much, Colonel Campbell. That's as fine an introduction as I get, because when you talk about the soldier and the troops, that's why we have a DARCOM; that's why we have a TRADOC; and if that isn't why we have it, I don't know any other reason.

I'd like to say good morning to you. It's a privilege and an honor to be here. I'm here because my boss, Lieutenant General Bob Lund, is meeting with the Army Project Managers. Once a year we get together and have all of the Project Managers in a three-day session to get the advice that they have for the leadership, as well as the other direction.

In looking at the agenda and wondering how I might make a contribution this morning, I noted that Admiral Williams was going to talk and also General Tice, and I knew that you would be properly stimulated, motivated, and attuned to the problems of the training device community, and training in general. So I thought that it might be worthwhile to just take a look at the present environment, admittedly from a DARCOM perspective, of where we stand and give you something for the next two or three days to form the background of training devices and training in general throughout the Army.

I would say first that the first commercial that you saw was really to get that picture of the soldier there. That's what that's really all about. So if we look at this outline -- I won't read the slide to you and I might say I don't have a prepared text this morning. I'll just comment on a number of slides. This one gives you a feel for some of the subjects that I hope to cover to look at the background and environment of training devices. I noted that Captain McHugh said we were going to talk about technology, management, and the user, and I think that's what that boilerplate says on the left. Looking at the last few slides that I'll have to talk to you about on future emphasis, it does give me the opportunity to tell one story. It seems that Tom Edison, who had a tremendous reputation for being absent-minded, was on a train and the conductor came through picking up the tickets. He got to Mr. Edison and asked for the ticket, and the famous and much-respected man began to feel in all of his pockets and in a minute or two, he seemed to be in a frenzy, searching for that ticket. The conductor was a little embarrassed at this great person going through the embarrassment of searching for it, and he said, "Sir, if you would just not bother about that -- I'm sure you have a ticket -- when you find it, simply mail it in to the company." He thought that would

take care of it all, but with that, Mr. Edison looked up and said, "Young man, I know I have the thing, but I've got to find it to see where I'm going." So it is with that spirit that I think we all have to keep a focus on where we're going and I hope, this morning, to talk a little bit about where we're trying to go from DARCOM as we work more closely with TRADOC to get at the problem of greater learning and increased training.

I talked about environment -- I won't leave this slide up for a long time; we don't need a lot of this kind of motivation, but if you're going to talk about the environment, that's the . . . you can read the lines at the bottom. Every once in a while we'll be on target. We can thank Mr. Herblock in the Washington Post for that kind of motivation.

The second slide is to put our friends, TRADOC, with us in that the perception may be that we need more of everything as opposed to those devices and that kind of training that will enhance the capability of a soldier.

I had to put those up front to give you a feel for the environment in which we would work.

I use this slide in purple-suited audiences and it's an over-statement to my friends in the Navy and the Air Force. But I like to use it because I think it does give you a characterization of the complexity of those things that the Army has to buy. Obviously, the training devices go right with the weapons systems. What I would say to you here is that if you look at the ship in the lower left, I could make the argument that the Navy lives in its shipyards and gets in its ships and sails off to sea, and you do your thing in that environment. The Air Force has the Air Force bases and you get in your airplanes and you go off into the wild blue yonder. Somehow out of that, it's a little more closed environment than the one in which the Army must deal, because when you begin to look at things -- and I could say we have some 8,000 aircraft versus some 9,000 for the Air Force -- I guess there are more bottoms when you look at ship bottoms than there are boats in the Navy. But not to make a brag speech, but to talk about that complexity just for a minute -- hand guns, tents, trucks, helmets, rifles -- those are the things that the Army really has to move and get going to comple-ment its weapons systems. There's an awful lot of training that has to go there. I say this also to say that the visibility that comes from that -- we all know that every mother's son is an expert in rifles and handguns and trucks, and it's the Army convoy and the Guard in the summer that causes that slow-down when you've got the kids and you're off to vacation at the shore. So I'll leave that there, but I would suggest to you that the things that we deal with in the Army get a lot more visibility from the American public in buying and going about the practice of buying, whether it's end items, weapons systems, or training devices.

The next slide, we talk about weapons systems, mostly. But it's also true for training devices. If you look at the decade of

the sixties when everybody was busy in Southeast Asia, and then along came the seventies and the Army began a massive research and development program -- a new main battle tank, two helicopters, the BLACKHAWK and now the APACHE, and the fighting vehicles, and the PATRIOT missile systems and on and on. Through the seventies, a massive development program, and then in the late seventies and the eighties, we started to go to production. As we started to go to production, we found that that bridge that separates design from production had grown much longer than it used to be. Basically, the equipment was World War II vintage and in modernizing the Army, that transition from engineering into production has been a most difficult job. In many cases, the production capability or the skills needed to produce were equal to the skills needed for the inventive engineers, the genius that gave us the systems to begin with. And so it's been a long way across that bridge and there are a few systems that are in the waters under it. When I say that, make the transition immediately to training devices, because some of those same difficulties of producing in quantities the devices we need, that transition has been characterized much as the transition of weapons systems. So I say to you only in talking to this slide, or I ask of you that when you're thinking training devices and you're thinking engineering and you're thinking about the technologies, take a hard, hard look at the production and whether or not we're going to be able to produce those kinds of devices in the quantities that we need.

Next slide -- not a lot of wiring diagrams, but just to acquaint you with the management of training devices within DARCOM, the Department of the Army, the Army staff, and then you see the Material Development Readiness Command, or DARCOM, in Alexandria. Of course, TRADOC is the requiring activity and we are responsible for the development of material and as those training devices are developed, the trained soldier goes to the Forces Command.

Just a one-minute commercial on DARCOM, since that's where I come from -- that's a big command that General Don Keith commands, some 174 installations, about 119,000 people at the present time, military and civilian; 39 general officers and 147 senior executive servants. By any measure, if you look at the Fortune 500, somewhere DARCOM gets in there. If you want to look at assets owned, we're right up there in the single digits and close to the top. But whatever measure you take, it's kind of hard to move us out of the first 15, when you talk about a $25 billion annual expenditure program. I guess the one statistic I would ask you to take home with you, if you take those 174 installations and take the square area -- now, there are a lot of test commands with cactus and that sort of thing -- but just put the acreage together and we're about equal to the state of New Jersey. I appreciate your listening to that commercial on DARCOM, but that's where training devices work through from the procurement standpoint and the acquisition standpoint. And this isn't any official bureaucrat's wiring diagram, but what I'm trying to show you here is that the PM TRADE reports directly to my boss, General Bob Lund, as Colonel Campbell said, the Deputy Commander for Research,

Development, and Engineering in Alexandria. What I showed you on this chart hopefully, also, is that he works very closely with Major General Gonzales, head of our Directorate for Development, Engineering, and Acquisition. He works very closely with General Gonzales and his folks in that Directorate and with the emphasis being on readiness and that soldier in the beginning, if he isn't ready to fight -- we've also shown the line, Lieutenant General Don Baybridge, who is now Deputy Commanding General for Material Readiness. He has a great impact on all that PM TRADE does, so as a part of Colonel Campbell's activities, he gets lots of help. And I think he said that to you a little earlier.

The next slide -- I mentioned that he gets lots of help and this simply shows some of the other folks that he has to work very closely with. I'll not go through all the acronyms, but you can see the Naval Training Equipment Center, University of Central Florida, DARPA on the lower right, and for those of you who don't know who DARPA is, we'll get you some information on that. Those are the folks that give PM TRADE lots of help as he works in that line capacity from DARCOM.

This is just a little transition chart. If we talk about technology -- General Tice, I don't mean to make a career decision this morning, but we talked a little about technology and Admiral Williams talked about new technology to serve our problems of train-ing, and I couldn't agree more that we need technology to work those problems. If I could, I would temper just a wee bit the urge of new technology when we've got to maximize that technology that we have at hand and that is emerging, and I'm sure you would agree with me, sir, to get some hardware out there, whether it's in weapons systems or training devices. I blunt that a wee bit be-cause there is a tendency to continue to develop and push the technology which we have to do, but we're going to have to build a little more hardware along the way. I won't get into citing any particular equipments because that gets personal to some of us, but let's get on with some of those programs we're developing as we continue to push the technology, too.

The real purpose for this slide was to say that the emphasis through DARCOM that we are putting on technology and in the train-ing device area is that the PM TRADE is the only PM of the Army's 50-some that has 6.2 money -- exploratory research money that he manages. Now, that's not to say that there isn't some of that effort going on in our laboratories and through some of our PMs, but Colonel Campbell's PM TRADE is the only PM that has 6.2 explora-tory money that the Army has put here purposely to try to keep us abreast of the technology.

This picture, again, is simply to say that most of that tech-nology base is going to have to come from industry. We look to that whole training device community to supply that and there's nothing much subtle about that. There's some seed money that I mentioned that we are putting in the area, but it's really to stimulate your activity in the technology base for training and training devices.

Again, a rather simple chart, but sometimes it's the simple truth that we overlook and the dilemma that we face is that of the high technology pays off well, but it's costly going in. The word "tight" is understood by all, and so we try to maximize that trade-off to get the most in the end product training for the dollars that we do spend.

Said another way -- and again a very simple chart -- to try to depict for you that possibility of enhancing the training of the soldier that if we have a weapon system at the top of that curve with that sort of potential, we show probability of hit and troop test results are somewhere in the margin, as we've shown, that's the possibility for relatively small expenditure, usually relatively small expenditure, as opposed to the cost to enhance that weapon system capability. That's the gap that we try to close.

Said one more way, and I guess this is the third way I've said it, if you're going to tell them, tell them you told them. Same kind of equation that if we can just get that equipment capability plus training, that is the real force multiplier for a ready Army.

I'll not go through this chart -- just let you read it. I don't think anybody would quarrel with it, but again, getting that soldier trained is a big impact as opposed to our business in DARCOM, where we concentrate an awful lot of our attention, and sometimes I think we really don't give enough attention to this area, but we know what well-trained and well-motivated troops are, also.

I have about a dozen slides, six pairs, and again, no magic, but I thought I might just refresh you as you prepare for the next two or three days of separate seminars and so forth, on just where we stand in the real world of training devices from an Army standpoint. What I would show you on the next series of charts is a weapon system and then corollary with the training device. When I look at weapon system, we'll look across six of the Army appropriation, and then we'll look at the training devices that we have there today. Then you'll see a companion slide right behind that where we talk about technologies that are emerging from those training devices. First, look at aircraft -- and again, I'll not read to you. That's the world of training devices today. I would point out on this one simply in the upper right-hand corner, you see visual system component development program. Here's an opportunity where we're looking at P^3I or pre-planned product improvement concept that as we get into our AH-64 or APACHE helicopter, we're developing a system that will come along later, but with concurrent development so that we can move that module in to give us the enhanced capability that we'll need in training pilots for the APACHE as it comes on line.

Some of the technologies involved -- if you get back at DARCOM and start looking across the spectrum of the weapons systems, it's easy to lose the fact that very high speed integrated circuits are making their way into the training device world

because folks there are more concentrated in their weapons systems area. But I point out again that there's a lot of technology that's growing out of the separate weapons systems.

In the missile areas, MILES will be shown throughout these charts. Nothing new again, just a refresher. And there is some new effort that is taking place at the present time. On the southeast corner of the chart when we talk about simulated tank and anti-armor systems, there is some interesting work in training devices just starting in that area.

Again, some of the technologies. Track vehicles -- I believe it was Admiral Williams who said there are some real bucks involved. I guess the only comment I'd have on this chart is that lower left hand corner, the conduct of fire trainers, is when we talk about the hardware involved there, we are well over a half billion dollars and on our way to a billion when all of those trainers are available produced, and available for troops. So there are lots of dollars.

Technologies again -- we look in the weapons area. I say to you once more that I simply use these charts as a refresher. Somehow we get busy on the big picture and it helps to back up once in awhile and take a look at where we are at the present time.

I don't know how many people in our Army are aware that we're using microprocessors in training equipment for weapons, such as the artillery piece that is shown here.

Some interesting work just about to begin, again at the lower part of this slide, when we look at an RPV operator trainer. Most of what this chart would say is that all of those technologies that we use in the hardware are also being brought to bear in the training device.

Technologies, again, span the spectrum. I would guess that the thermal image generation and optics that are being developed in this training device area are certainly approaching the complexity of those used in weapons themselves.

So much for technologies and systems ongoing. I thought you might be a little interested in the program for training devices, and I have to say this as any other speaker, I would think, would guardedly say these days, that some interesting things are going on in Washington with respect to where that program will come out. You are just as subject to fluctuation in this community as the rest of the community is, but I'm going to show you the best numbers we have and they're as good as any other numbers you'll find in other programs looking across the budget.

Again, if we think it's small business, that will give you some idea of where PM TRADE program is. This chart serves two purposes and I used one like this in a couple of other areas, as we try to keep our thumb on how activities are doing. Usually it's

a brag chart for the activity that you're talking about -- how many millions and how many projects you've got going -- but I like to use it as a club. Club meaning that when you ask Colonel Campbell where we are in programs and projects, my emphasis is to get that down to zero, because you know, there are a few of those -- and I'm sure that I can be proven wrong -- but there might be a few that we're sorting of hanging on the margin that we ought to go ahead and get finished and off the margin, because some folks hold onto them looking for growth. If we're going to get those trainers out to the folks that need them, and the same way with weapons systems, we've got to keep getting that down. That's the 83 program as I understand it, so therefore I'm assured that there aren't any programs such as I've just described in there.

This shows you another cut at the 83 program. I would mention in that customer part of it, there's where you see the conduct of fire trainer and the other systems trainers for the Armored community.

In the FYDEP, you're looking at the kind of dollars that we're talking about. As you look at the out years with the money going down, that shows some major buys in our program for 85 and 86. That's the kind of dollars that PM TRADE is talking about, and I would say to you that those bars are a lot taller than they were some six or seven years ago when we began to put emphasis in this area.

Improving the process -- just a few words to talk about where we might go in the future or to make sure, unlike Mr. Edison, that we do have our ticket. What I'll talk about here, I'd like to put this slide up and say that I think the real improvement within the Army, the margin for improvement, is the closeness of TRADOC and DARCOM to work the training problem as we work the weapons system program. The whole notion of the requirement and the end product training device, if you look at it simply in a hardware sense, and I feel that over the years somehow or other, we may have been looking too closely at that piece of it. We've got to work closer with TRADOC and TRADOC with DARCOM and that is happening. To look at the training problem in the sense of an integrated systems approach to the trained soldier, as opposed to doctrine and then hardware being two different aspects.

Nothing magic about this chart either. It's training systems costs and we heard some words on that, words of wisdom. The second one I put on this chart mostly to remind me and to remind you that there is a perception sometimes that DARCOM gives the answers before TRADOC asks the questions, or TRADOC gives the answers before we ask the question, and that's why I say that whole world has to come closer together to better answer the training question. I'll say a few more words about that, but that's where the real -- the first and the third on this chart are given. Again, the third one, I wanted to say just a word about the technologies. We've got to make use of existing technologies as well as emerging

technologies to get some of the devices there that we need to train soldiers, and keeping ahead of the curve in the technologies, yes, that's it, but not so much so that we outrun the hardware.

When we talk about an integrated systems approach, we should start with that near the curve that is shown on the far right, and then work the first two. In other words, it's a question of investment cost and then the operating cost in a sense of operating the training device, whether it's a simulator or what have you. It's maximizing the investment cost and then the training, you're able to get from that investment that gives you the end sum of the total training cost.

I ask "dare we?" because this is a challenge. This is a challenge -- I've been around DARCOM for quite a while and we've worked closely with TRADOC over the years. I've never felt the time when that closeness was more real than it is today with two commands looking at the total training in question. We put more emphasis and we've come a long way in major weapons systems acquisition strategy. If I were doing this chart again, I would add the word "acquisition" in both places. Major weapons systems acquisition strategy and a completely integrated training system acquisition strategy. What I'm saying is that before we begin the development of a new helicopter, tank, missile system, there's an awful lot of effort that goes into thinking all the way through the acquisition strategy from the very beginning of exploratory development or back in the even earlier stages, and we look down the pike and begin to work that strawman as to where we're going to get them, what's the industrial base going to be, will we need three suppliers, when do we get competition, how do we get there? We do an awful lot of work on that. How successful we are, we'll see. But I know that we've done more in that area than we have on what's at the bottom of this chart. We've got to do a better collective job of getting the objectives out in front, working the doctrine problem, and working all of that in the requirement. And DARCOM's piece of that responsibility is just as much as TRADOC's, and that working together will bring us to the point where we can look at an integrated training system. The perception in many areas is that we develop a device and then we find out how to train somebody. That's an overstatement, but if back at the beginning when you're looking at developing a weapon system, and, General Tice, if you want to think about the number of people that it takes to train and the people to use, etc., it just seems to me that we've got to work that problem a lot more right back at the beginning. We may be buying different combinations of training systems; we may be buying different training devices, more or less depending on how well we've thought that problem through.

Ladies and gentlemen, I thank you very much for these rather informal remarks. When I thought about how I might be able to make a contribution this morning, it was to sort of set the stage for what you're going through. I finish as I began with a picture of a soldier on this slide, because if the Army isn't ready, then all that we do really hasn't amounted to much. Thank you very much.

Dr. Gardner

Thank you, Mr. Blanchard.

As I listened to that briefing, it was difficult to remember that PM TRADE, as you mentioned, was created in 1974. I think that's remarkable, the developments that have been achieved in less than 10 years, and I think it's indicative of what we can expect in the next 10, the rapid advances. I am impressed.

LUNCHEON SESSION

Colonel A. J. Castellana

This morning during the break, one of my civilian colleagues put his arm around my shoulder as I was peering inside of this huge ediface here, and he said, "Hey, Colonel -- that's just like a mess tent in the Marine Corps." I thought about it for a little while, and you know, as a matter of fact, that is a fact. The mess in the field is about comparable. I would suggest that if you believe that, that there is a Marine in dress blues in the lobby ready to take your name and a bus outside on its way to Parris Island.

Chairman Gardner, Acting President Watson, distinguished guests, brother officers, our speaker's topic today is The Cutting Edge. And as we just contemplate those words, obviously, cutting whatever area we're talking about is serious business. And it reminds me of the story of a psychopath who had this hallucination that he had a cat in his stomach. And after many, many sessions with the psychiatrist, who could not convince him that he didn't have a cat in there, appropriately the doctor feigned -- or rather simulated -- an operation; simulated cutting his flesh and simulated the closure. After our friend came out of the ether, the doctor was standing beside his bed holding a black cat, and he said, "There, see -- your troubles are over." And our friend groaned just a little bit and he looked up at the doctor and said, "Not hardly -- my cat was grey." So it is, I think, with training, and particularly with Marine Corps training today. We reach for a cat or a training plan and we come up with a whole belly full of kittens that have names like CAI, CMI, CBE, ISD, ILSP, and whatever these names are. It reminds me of a Chicago winter -- it's the elements that really cause the problem.

Our speaker today is one who knows about the business of Marines as it is, but more particularly as it should be. He has been the Commanding General of the First Marine Amphibious Force; he has been the Commanding General of the First Marine Division; he has commanded the Marine Corps Recruit Depot in San Diego; he has commanded an infantry battalion in Viet Nam; and he has

commanded reconnaissance platoons and rifle platoons in Korea. More
especially, he was a foot soldier in World War II and in China.
His undergraduate degree is in Political Science, and his graduate
degree is in Business. Our famous Marine, General Chesty Puller,
said one time that a Marine's combat infantryman's badge was his
Purple Heart, and our speaker's personal decorations include three
Silver Stars, the Defense Superior Service Medal, the Legion of
Merit with Combat V, the Bronze Star Medal with Combat V, two Navy
Commendation Medals with Combat Vs, and six Purple Hearts. Ladies
and gentlemen, please help me welcome the Deputy Chief of Staff
for Training, United States Marine Corps -- the Marine's Marine --
Major General James L. Day.

Major General James L. Day

Ladies and gentlemen, the entire Marine contingent that you
see on my left and my immediate forward appreciate the opportunity
to attend this conference. We think that there is no better way
to have an exchange of ideas than to have that exchange exist be-
tween the people who are the users, and that seems to be one of the
dedicated themes to this conference, and the people who give us that
usable material.

I'd like to echo the remarks of Admiral Williams and General
Tice and Mr. Blanchard this morning when they said that manageabili-
ty of what we already have is probably as big a problem as trying
to figure out what we need for the future. And that's true. The
maintenance of the equipment we have is a preponderous effort. It
is one that we don't know if we've whipped yet, and I'm sure within
the Marine Corps we have not whipped. We know that that money has
to be up forward for maintaining the equipment that you so ably
describe and prescribe for us. We know that we haven't put that money
where it should be as yet.

When we talk about training money and you take a look at the
overall amount of funds that it takes to support the Department of
Defense, we're not talking about a large pail of cash, but we're
talking about much more today, percentage-wise, much, much more today
than we were even ten years ago. It is important to learn how to
use what we have, become familiar with it, and get it out to our
operating forces. That seems pretty simplistic on the surface, but
there are in-built obstacles that keep us from doing that and one
of those things is an obstacle that is built within the military
that we'd like to get the material out there first because we want
to help that guy who is out front. And that man who's out front is
the man I'd like to talk about today, because although I agree
thoroughly that we have to maintain and we have to take care and
we have to improve on what we have, we need something else for the
guy that's the vanguard of our defense.

Mr. Blanchard expounded today on that rifleman, that individual
soldier who is so important to all of us, and nobody in this room, I
believe, can disbelieve that, particularly the military. He is the
guy who's the cutting edge; he's the guy who operates day in and day

out without any respite; he's the guy who looks back and can see that
the technological advances that have been made are there on the Corps
level or an Army level or the Division level -- they're there at
Regimental Headquarters -- they're there at the Battalion level, but
none of it has filtered down to the rifle squad. Now, we have some
things in a rifle squad -- as an example, we have radios today that
we didn't have 30 years ago and they're pretty good pieces of equip-
ment. But that doesn't help that rifleman when he closes with the
enemy and attempts to destroy him. The things that that rifleman
carries basically are a rifle, hand grenades, and a bayonet. The
rifle as we know it today is a good piece of equipment -- probably
one of the finest in the world -- and with the changes that are coming
about in that M-16, it will be the finest. But basically, it's no
different than a rifle we had before the turn of the century. The
automatic weapons that support that infantryman on the forward edge
are no different than the Hotchkiss ammunition or type of weapon we
had before the turn of the century. The grenade that he uses is
a hell of a killing weapon -- it can kill out to 35 meters. The
grenade that was developed in 1882 could kill at 35 meters. And the
bayonet has been virtually unchanged in over 300 years of warfare.

So when you're talking about the cutting edge, and you're talking
about your advancements and your technology, when you're talking about
what we have in our inventories and what we have to support this young
man, you're not talking directly to him. And you haven't been talk-
ing to him since his existence.

I'd like to compare that young man today to a man that you do
support -- the Division Commander -- whether it be Army or Marine
division, this is the closest guy that leads the largest tactical
unit within our armed forces; he's a man who gets mud on his boots;
but he's also a guy who recognizes and is probably a primary benefit
of that technology that you've been developing. I'd like to compare
that Division Commander and the word responsibility that we put on
his shoulders. We say that that's the Division Commander because he
commands a 22,000-man Division, has awesome responsibility. He does
have a lot of responsibility, but I'd like to compare that responsi-
bility to the Marine Corps fire team leader or, if you will, in some
cases the squad leader, whether he be Army or Marine Corps, and to
show you where that true responsibility actually is nested.

I'd like to walk you through one day of combat so you can take
a look at the equipment that you have and that you have on the Divi-
sion level, and then take a look at what he has down there. One day
of combat in the life of a Division Commander and a fire team leader.

The Division Commander, as I said, is your largest tactical
unit in the Armed Forces. In a Marine division of 22,000 men, we
compare favorably in size, probably, with any division in the world
today. Many divisions aren't that large -- a few are larger, but
there's nothing behind the Iron Curtain that is as large as 22,000
men in a Division. That Division Commander gets up first thing in

the morning and he normally gets up after a night of rest in a pretty clean bed -- certainly a dry bed -- and he gets up at dawn and gets briefed by 18 special staff members of his division. Those staff members are engineers and they're operators and they're intelligence people and they're medical people and they're supply people and they're logisticians. They run the entire gamut of anything that he's going to run into in combat and, yes, one of them is a trainer, because you're not always in war, even in a combat theater -- you're back sometimes getting retrained. He has that whole gamut of expertise that tells him what to do. They tell him what he should do during the day and they tell him what has happened the night before. So he gets in a plane after the briefing, after a leisurely breakfast -- and it's usually warm -- and he flies up and he visits the front line organization. Then he comes back at noon and he has another leisurely meal and he has another debriefing. That afternoon he probably goes out again to observe the First Marines in assault, the Seventh Marines who are following in trace, the Fifth Marines who are in reserve, and the Eleventh Marines who are supplying the artillery support. In addition, he visits his tank battalion, his AMTRAK battalion, his reconnaissance battalion, and his support battalion. Every one of those organizations that I just mentioned at the headquarters level are technologically advanced. He probably visits some of the rear area units where the high technology again is nested. He comes back after that visit, he goes to bed that night after a final briefing, and he probably isn't awakened all night after he once goes to bed unless there's a counterattack, unless there's some sort of a breakthrough, or unless there's an imminent threat against the regiment or the Division CP.

Now, how about that rifleman? The kid who leads the fire team. He's a Lance Corporal. He gets up in the morning at the break of dawn. He probably hasn't gotten all that much sleep. It's a two-man foxhole and he's in charge of four men total in that fire team. He has administered to their wounds; he has made sure that they have ammunition, that they have enough water and enough food to get through the night. He makes sure that when the counterattack does hit that his weapons know what their principal direction of fire is. He wants to make sure that you know what the principal direction of fire weapon is. He makes sure that the tactical wire is put in the proper place and that the protective wire is put in the proper place. He makes sure that the mine fields are put out there. He makes sure that he knows where all of his automatic weapons are supposed to be firing. And then he gets ready to issue the order for the day. When he issues that order he knows that he's going to be under attack from the minute that he steps out of that foxhole until the conclusion of battle that day. And he doesn't have the latitude or the luxury to visit an organization to have a cup of coffee and to visit that organization to say, "how are you doing," because he's right where the "how are you doing" is taking place. He is the vanguard. He is the cutting edge. He is the man who stays out there all day and there is always one hill after the next hill that he takes. There's always another rice paddy to cross. There's always another wooded area to take. This goes on throughout the day and throughout the day the normal rifleman in combat is replenished with ammunition three or four times.

During that phase of combat, he is probably calling in artil-
lery. He is certainly calling in mortars. He's arranging for air-
support; he's arranging for naval gun support if it's within range;
he has to do all of this. He has to do on his level and although he
might not magically press that button, he is the one who tells the
platoon leader or platoon sergeant what he needs. At the end of that
day, again after he has administered to his wounded, he has welcomed
the replacements in, he prepares for the night defense and he goes
through the same thing that he went through the previous night. He
puts in those sectors of fire. He's pretty busy. He's probably the
busiest man in combat we have, and yet he's doing it with a rifle,
and with a bayonet, and a grenade.

This morning when Mr. Blanchard flashed one slide on the screen,
I thought there was something missing from there -- you talked about
your Spartans and your Greeks and the Australians. The one thing
that was missing was the United States Army Infantryman and the
Battle of the Bulge. We've never basked in lighter glory than those
people gave us during that battle, and that should be on that stage,
because that's one thing that perfectly describes the infantryman
today.

Now, if you asked that Division Commander, with all this support
that he has and with a lot of the things that we now see over here --
MILES for training and we see the different types of . . . and the
other things that we have in training -- if you asked that Division
Commander what he wants to accomplish in one day of combat, he'll tell
you he wants his people to be well trained and to carry the battle
that day. If you ask that rifleman, who is a Lance Corporal, what he
wants to see more than anything else in the world, he's going to say
it in one word -- tomorrow. He wants to see tomorrow.

Those of you who are sitting out here today can make sure that
he sees all the tomorrows he wants if you give him what he needs.
Because he's got that capability; he's got that dedication; he's got
everything going for him, but he doesn't have the exact change that
he needs, that he hasn't had in the past. He's a magnificent soldier.
He can do anything. I can compare him with a seaman aboard ship; I
can compare him with the air crewman in the Air Force; and I can com-
pare him with that rifleman in an Army squad, but I only compare him
with the Marine Corps because that's all I know. He needs your sup-
port. Thank you.

Colonel Castellana

Thank you very much, General Day. The subject of Marines and
things that Marines do is obviously a favorite one for both of us.

I'm sure that you enjoyed your lunch. We are just about ready
to move out for our next session.

USER PANEL, U.S. MARINE CORPS

Colonel Castellana, Panel Moderator

May I present the Deputy Chief of Staff for Training at Headquarters, Marine Corps, Major General James Day.

Major General James Day

Once again, welcome, and I'd like to iterate the point that I made earlier to many of you. I'm new in this job. I've just been in it about a month and a half. I don't think that I'm new to Training, and don't feel that I'm new to Training, because I think that every Field Commander feels that he is the Trainer in the Marine Corps. I think that I feel the same way today. As the Trainer, I've learned quite a few things since I've been in this job and one of them has been the affiliation that we have with the people that help us develop and help us recognize what we need so we can bring it out to our forces.

We've almost reached the stage of the game where we in the military are able to articulate to you what our needs are and we have been able to do this, probably, for the past 10 or 12 years. I know it wasn't in existence before, but today I think we can do that. But today I think we need something else, something more than this articulation. That's the fact that we almost have to, you and I, be almost clairvoyant in order to come up with the systems that we need or the changes to the systems that we need in order to keep abreast of the guy who is our primary threat. Because where he works on these things on a 24-hour basis, and where his resources are unlimited, we do have constraints on ours. Well, that clairvoyancy may replace, someday, articulation and I hope that it starts very shortly, because by the time that we articulate what we need to you, and the time that we get that piece of equipment, we're talking sometimes 10 years and sometimes more. By a little bit of clairvoyance, perhaps, we can cut that time to where we can support the people we should be supporting.

With those remarks, I'd like to turn it back over to Colonel Castellana.

Colonel Castellana

Let me give you an oversight of our panel. Each of these officers has spent his time in the trenches, has served in the field, currently is in a significant position at Headquarters, Marine Corps, where each is formulating policy, implementing that policy after it has been approved. They are the individuals who, in training, literally make things happen. They are the people who develop the ideas and bring them to fruition.

Let me ask our next panel member, Colonel White, to introduce himself.

Colonel Frank White

Good afternoon. My name is Colonel Frank White. I'm General Day's principal assistant at Headquarters, Marine Corps. By way of reference, if the Beirut situation had happened about a year ago today, it would have been my ugly mug that you would have seen splashed all over television, rather than Colonel Jim Meade, whom you were privileged to see, because about a year ago, I commanded the 34th Marine Amphibious Unit, . . . deployed in the Mediterranean. Just prior to that, I was the Assistant Chief of Staff, G-3, of the 2nd Marine Division at Camp LeJeune and the Commanding Officer of the 6th Marine Regiment. As Colonel Castellana commented having coming from the trenches, I have done so very reluctantly I must add, to Washington, where I have been for about six months the Assistant to the Deputy Chief of Staff for Training.

General Day spoke earlier about the cutting edge, and at the Headquarters level, those of us with some field experience now in the Washington arena, have really a dual task. It is in effect to enable those who presently train Marines to train them so that that cutting edge is indeed fine, sharp, and durable. But it is also to plan and program so that in the out years -- 85, 86, and beyond -- the clairvoyance that General Day just referred to can somehow be hardened a bit into programs for procurement of things, procurement of software, and for that matter, the training of people. We, as training programmers and planners, if you will, need to know who they are, what they're capable of, how many there are going to be, and what the skill and attitude requirements, as well as knowledge requirements, are going to be when these young men and women finish our formal school training program and join the operational unit. I suggest to you that we need to work together to become more articulate and, if necessary, more clairvoyant in identifying who the trainee is and what it is he or she must be capable of when they enter the Armed Forces of the United States.

In that regard, we face some very severe resource constraints and we have to work within those. One of those that is not often articulated well is that of time, which translates to money. To get the trainee trained, to get him or her into an operating unit, how long is it going to take us? How much is it going to cost? What are we going to have to do it with? How are we going to maintain that which we use to train them? All of these things are questions which I think we must work together to resolve, not just the technologically-based skills and attitudes, but also for those more general or softer skilled on the battlefield of the future.

We also have to deal, I think, with the reality of who the trainers are. They are not formally schooled trained experts in instructional systems development or integrated logistics support or any other of the programs and policies. For the most part, they

are operators, such as most of us are here today, such as General
Day is. And I think we must recognize together again, and you
must help us develop products for those people who conduct the
bulk of our operationally-related training. Those people are the
operational commanders who are faced with personnel turbulence,
and quick turn, therefore, is a concern to them.

(Due to technical difficulties, the remainder of Colonel White's
remarks was not recorded.

Major David Gee

I'm Dave Gee. I'm the acquisition program sponsor officer at
Headquarters, Marine Corps, Motor Transport Equipment.

The Motor Transport community has excellent, sophisticated for-
mal school training for entry skill levels and progression levels
such as for your intermediate supervisor. However, we do, in fact,
have a void in providing training materials and techniques to the
units and to the Commanders on the unit level, such as to satisfy
requirements for incidental drivers because not every one is a
motor transport operator. We have to use infantrymen and artil-
lery. And also for cross training individuals to operate expen-
sive, complex refuelers, due to the fact that we have attritions
for various and sundry other reasons that every commodity branch
has.

In order to satisfy this, we feel in the motor transport com-
munity that we could have coordinated industry/Headquarters Marine
Corps effort in developing inexpensive simulators, not only of
equipment orientation but also for operational techniques, con-
voys, immediate action drills, and things of that nature. That's
where our problem right now happens to lie. In addition to that,
the motor transport community is growing, due to the fact that
we are introducing three or four new fleets. This training de-
vice would coincide and assist us not only in developing our
grade levels from private through sergeant so they could, in fact,
make that progression through proficiency and skill level,
which is a basic requirement in the Marine Corps, but also ease
the introduction of these expensive, sophisticated systems such
as the . . . quarter ton high mobility multi-purpose vehicle and
the logistic vehicle system, better known as the Dragon Wagon.
This is where our requirement lies.

Lieutenant Colonel Robert Fairfield

. . . The Marine Corps, thanks to our friends in the Navy, and ourselves, is operating some of the most sophisticated flight simulators in the world. We have several new types coming on line within the immediate future. The Naval Air Systems Command and the Naval Training Equipment Center have given us some of the best equipment available and they are doing a good job of updating it. Generally, we're very pleased with the quality of the equipment and the type of training our pilots are getting today in the field. We are looking forward to increasing usage of operational flight trainers and weapons tactics trainers.

Other areas that we're looking forward to in the future that we need some increased training capabilities in are already known throughout most of the industry. We're looking for some increased fidelity and capability in the air-to-ground mode. We're still way behind on that. In the same area, we're looking for increasing technology for high speed, low level flights. These things are being worked on now and we plan on getting into them better.

In another area, we foresee a very expanded role in part task trainers. I think that's a key to some very increased capability and increased readiness. Some of the areas have already been mentioned on this -- electronic countermeasures and these areas.

The other area that I think may be our biggest future is training management. The technology has expanded and grown and outstripped the commander's ability to effectively analyze and coordinate his training requirements. We're seeing some real lags in training programs and training plans relative to the new equipment.

In order to get the best value out of the expensive equipment we're putting on the line, we're going to have to come up with some new training programs and some new management approaches to utilization of this equipment and optimization of the material.

I will now pass to Lieutenant Colonel Jack Wagner, who will talk to you on maintenance training.

Lieutenant Colonel J. R. Wagner

Good afternoon. I'm Lt Col Jack Wagner from the Aviation Training Branch. I've been asked to say a few words about aviation maintenance training and training devices.

To harp on how important it is to have trained technicians to maintain readiness is like preaching to the choir, so I'll go into our basic requirements. Our needs are two-fold. In aviation training, we have two levels of training; we have to train to the organizational level and we have to train to the intermediate level. The intermediate level deals primarily with black boxes, engines, or air frame repair. That's the middle echelon level of repair. There is a basic general opinion that in most cases, not all, actually working on the actual piece of gear is probably the best way of training.

The organizational level is another situation. It addresses the needs of the lowest echelon of maintenance. This can usually be referred to as "remove and replace," or "fix in place." The largest requirement at the organizational level is being able to troubleshoot and find out what the problem is.

Our needs, simply put, equate to being able to quickly and accurately diagnose the problem and what needs to be done to rectify it. This can be done in almost any mode of training, from working right on the aircraft in a framp environment to a total simulation or a combination of both.

In the era of the multi-million dollar aircraft, one cannot afford to allow personnel to learn by costly mistakes. It is our goal to have all technicians trained to the highest degree possible to enable the Marine Corps to meet its mission requirements.

I'll be followed by Lt Col Alex Powell, Ground Training.

Lieutenant Colonel A. W. Powell

Good afternoon. A year ago last week, I formed a new section within the Training Department and the mission of that section was, for the first time, to have a dedicated Training Department representative sit on all the coordinating groups for acquisition of new systems in the Marine Corps. The other officer in the section and myself, as well as Lt Col Wagner, are provided training plans for equipment ranging from weapons, vehicles, manned control and communications equipment.

Primarily, our responsibility is to forecast training requirements as early as possible and to state in the process of and acquisition, provide the resources to see that those requirements can be satisfied, to prepare a plan, implement training, hopefully in place when the system is fielded.

The current leadership in the Defense Department has been extremely responsive to a long-stated need that the acquisition process be shortened. I certainly think this is a positive pattern. At least now we have hope that when we purchase a new weapon system, by the time we field it it will not be on the road to oblivion, out-moded within two or three years.

In terms of time, we have taken what has been a cycle lasting 5 to 10 years, reduced it in some cases to 2 to 3 years. As I said before, this is positive. My section certainly supports it. It places great challenges on those of us like trainers who are responsible for providing the support for that equipment, for having that supporting structure in place when the equipment is fielded so that the equipment's full potential is realized.

Program initiation -- the actual cost of training support, to include training devices -- is very difficult to accurately project. Consequently, the tail we add to an initiative is usually an estimate based on what we have seen historically in what we consider comparable systems. Sometimes it's hard to avoid an apples and oranges comparison. If we deliberately go on the low side, as we are sometimes encouraged to do to make the program salable, we find that adding additional resources later in the game is very hard task to accomplish. On the other hard, if we faithfully go on the high side, our estimate of what training support might cost and if we don't very quickly develop strong substantiating data to back up a request for those funds, we find ourselves proprietors over a pool that the acquisition sponsor can dip into when he sees cost overruns in the actual equipment.

Two general categories of training device my section deals with most frequently are operator and maintenance trainers. Each of these has its own unique problem. I'd like to speak first briefly about operator or crew trainers. Principally, they are now found in institutions.

Echoing what a lot of other speakers have said today, I think that their greatest utility may very well be in units. We have problems right now, not only fielding, but making effective use of operator -- I speak specifically of gunnery trainers -- in units. For one reason, we're still looking for good, reliable, and effective trainers at a low enough cost that we can make the wide distribution that would be necessary to get them into the hands of Marines at the Company level or the Battery level.

On the other hand, even when a good device at an affordable price does exist, there's still a wide presumption in the field that actual equipment or in full caliber ammunition is the only valid way to train.

What are we going to do to overcome this user reluctance to use gunnery trainers? I think one of the most important elements and one that we often neglect is when the training device itself

is fielded, it needs to be fielded with well developed instructional materials and manuals that place the trainer in its proper perspective.

. . . . . what the limitations are, how it can fit into his overall training strategy, perhaps some innovative scenarios in which the item can be used. I think this will go a long way to overcome user reluctance, to make training devices a large part of their strategy. I think we'd be miles ahead for it.

Maintenance trainers have another problem. User acceptance isn't too much of a factor with maintenance trainers. It is rather obvious to most people, particularly in diagnosing and troubleshooting, key maintenance skills, that . . . input into actual equipment is risky business. The trainer puts you far ahead. The great problem we have with this is related directly to the shortened acquisition cycle, which I think is a good idea but which gives us challenges. That is that sometimes even after a production contract has been signed, the end item itself is still highly susceptible to engineering changes. Perhaps it didn't quite meet the requirements in operational testing, but we still signed the contract. Engineering changes are being made. It may not affect an operator trainer too much, but it could seriously affect the validity of a maintenance trainer. If we want to field that trainer and have our institutional training strategy based in large part around an effective maintenance trainer, the one point in time we have to either freeze design changes or, if that can't be done, put a lot of effect into quick, concurrent changes in the design of the maintenance trainer.

We haven't really learned yet how to overcome this problem. Any sound and affordable solutions that any of you might have are certainly solicited and welcome. Thank you.

Colonel Castellana

. . . Obviously, the panel indicates that there is a wide range of needs in training in the Marine Corps. Perhaps now you would like to ask some more specific questions that will address your personal interest or your company's interest.

Question

Colonel, did I understand you to say that in the Marine Corps, so far as the gunners are concerned, you are seeking some type of training ammunition as opposed to a regular HE round for a 155, for example?

Lt. Col. Powell

Not simply training ammunition. I look at any substitute for full caliber ammunition as being something we'd want to look at,

primarily because of the cost of ammunition. This can include the sub-caliber device; it could include full caliber training ammunition -- a TPT round vice an HE round, for instance; or it could include a training device or simulator that simply trains a gunner to track, delay, to acquire the target without actually being used on the actual equipment.

Question

Then the consideration is, then, that the regular ammunition is too expensive to use in large caliber for training. Is that what I understand you to say?

Lt. Col. Powell

That's correct. One system that we're now acquiring, the light armored vehicle, has as its main armament 25 mm ammunition. 25 mm ammunition is $30 for just the practice round; the rate of fire varies from 100 to 200 rounds per minute. You could shoot your annual allowance in 2 minutes. That's an exaggeration, but that's the nature of the problem.

Colonel White

I think just to amplify that a bit, if you want some numbers, the cost of a 105 mm round was about $23 or $24; the cost of a new 155 is about $250. It takes, theoretically, about as many rounds of each to become fully qualified as an artillery gun crew, for example. We run out of bullets, because the number of bullets we can buy is linked to the amount of dollars that Congress authorizes us to spend. So we're looking for ways to qualify our individual crews and the observers and squad leaders who use them at a lesser cost with, hopefully, the same effect. We don't pretend to have the answer to that one. Maybe you do.

Question

General Day, I want to say I enjoyed very much your talk. It was very thrilling and it brought back the thought that yes, we must think about the guy that's down at the bottom of the line. I know on your panel that you couldn't address everything, but one subject you missed, which I am quite interested in, is tactical trainers. I'd like to know something about the Marine Corps need for training of, say, Division staffs or Regimental staffs using the more sophisticated computer techniques that are available.

MGEN Day

I can cover that briefly from a former Division Commander's standpoint. We have in the field some of those pieces of equipment right now. Notably, we have one called TWSEAS. In this, a Division Commander can go down and train on that piece of equipment.

He can move his regiments around; . . . he can not only move his regiments, he can move his air wing around and he can move his support around. That can be used, also, down to almost the lowest level that you have and the lowest level that we used it at was the Rifle Platoon Commander's level. We felt that the people who made the greatest inroads for the use of that piece of equipment were Company Commanders and Battalion Commanders. It can simulate almost anything that you want to simulate in any type of field condition, any type of weather condition, any type of enemy condition, any type of close terrain or open terrain. It's a pretty good piece of equipment. I believe that Colonel White is more familiar with this than I and maybe he has a few comments.

Colonel White

For those of you who may or may not be familiar with the Tactical Warfare Simulation, Evaluation, and Analysis System -- TWSEAS -- it is, in essence, a computer generated war game tactical trainer for organizations who have staffs or who do staff types of planning. It doesn't go bang, it doesn't whistle, it doesn't go burp in the night, as we say, but it does in fact provide the same kinds of input to commanders and staffs which they would receive in a command post in actual combat. It is, in fact, the combat simulator in that sense. It will provide damage assessment based on use of weapon; concentration of force, for example -- you can vary movement across different types of terrain and so on. We've also begun a quite vigorous program and the folks here at NTEC are largely instrumental in that regard, in the manual wargaming systems, which can be used at all levels, starting at the lowest tactical level -- rifle platoon -- and moving on upward through the Marine Amphibious Force. Some of these games have now been fielded in the prototype stage and even in their early prototype stage have achieved such a degree of popularity that they are being used in some of our formal schools just as they are. Where we train our young lieutenants, for example, is called the Basic School at Quantico. They have become so enthralled with this type of approach, they've grabbed off a couple of . . . prototypes and are starting to use it. We recognize the need, as General Day mentioned earlier, to train the Commanders. We train at all levels. I hope this answers your question. If not, I think we could probably expand on it if you care to.

Question

I have a question for the panel and it relates to the status of the LCAC -- the Landing Craft Air Cushion. Could you tell us what the status of that vehicle is and, more particularly in terms of the interest here, the trainers' involvement.

MGEN Day

Everybody is looking at me, and as I know very little about it, I have no one else to pass it on to. The LCAC, we feel, is a

viable type of delivery system for our troops, and for those of
you who aren't familiar with it, it's just a ground effects machine
that gets us, particularly from our standpoint, from the amphibi-
ous mode ashore. It's more or less a delivery system, with the
idea that in the future it probably will be one of the most effec-
tive types of logistics delivery systems that we have. We're
real pleased with the prototypes that we have now. We would like
to have been able to test more; we would like to have been able
to test this thing more thoroughly 25 years ago, when, incidentally,
our threat nation first came into existence on this same problem --
probably more than 25 years ago -- 1954, right after Korea. We
have probably let the program slide more than we should have.
Right now we have given added impetus to it. We are coming along
with models that we think will suffice to bring our tanks ashore,
to bring our personnel ashore, but if you've seen any of the late
articles on the Russian Infantry, which are the equivalent to the
United States Marine Corps, you'll notice that they were able to
move something like 55,000 tons ashore at any given time and bring
three companies of their Marines ashore in the assault. It's the
type of delivery system that can come from an amphibious ship
ashore at plus-50 miles per hour. Now, the present amtrack we
have, we can do it at about 8 miles an hour. So you can see the
difference, the window that is open for enemy gunfire and for air
and anything else that wants to be used against us. We can't get
ashore as quickly as they can right now. We should be able to.
We think it has great potential. We're pursuing it and we think
we're going to have it in the system before too long.

Question

How does the Marine Corps train your gunners and anti-tank
missilery?

Lt. Col. Powell

We have currently two, a light and heavy anti-tank missile.
The DRAGON is the primary means of training as a launch effects
trainer. Each DRAGON gunner has allowance for training of one
missile per year. They fire this primarily to validate, and the
training strategy is built around learning the skills on the
launch effects trainer and then firing a missile a year to vali-
date. TOW, the heavy anti-armor missile that we have, has a
similar program. It is not a launch effects trainer, but an item
called the M-70. The M-70 is once again primarily tracking. It
comes with a receiving unit that can be placed on a jeep. The
opportunity is there to track a moving target and the TOW gunner
has a training allowance of one missile per year. This, hopefully,
will follow a strategy of using the M-70 to train, validating with
the actual missile. The MILES system, if you're familiar with
that -- an engagement simulation system. It's adaptable to both
DRAGON and TOW. It's activated by a device called the ATWES,
which provides the noise and concussion to cause the MILES emitter
to transmit a signal.

Colonel Castellana

Perhaps you might be familiar with the STAAGS, which is the Stationary Tank Anti-Armor Gunnery System. Is that familiar to you? There are now two versions of this device that are being developed in the laboratories at the Naval Training Equipment Center; one plug-in element is for the DRAGON, and the second current plug-in element is for the TOW. That's still a laboratory model and you can see it here. People from the Research Department have this research model here on demonstration.

Lt. Col. Powell

I'd like to just add one thing if you are interested in this. I'll tell you briefly what the shortcomings of the two systems are, because of course, that's what we're always looking for is to overcome the shortcomings. The launch effects trainer lacks functional fidelity, primarily in the shifting of weight. I guess STAAGS will somehow compensate for that, we hope. The weight transfer, going over the shoulder, is critical with the DRAGON gunner because the launcher is so light and so dependent on his holding it steady. The M-70 TOW lacks ballistic fidelity with the flight of the TOW missile. The M-70 tracks, but it doesn't present some of the challenge that the ballistic characteristics of the missile itself might present the gunner.

Question

Would you address the NBC environment?

Panel Comment

In words of one syllable, it's a dog; it's tough. We all recognize the impact of the threat. And we do not have, to my knowledge, effective ways of simulating or of approximating the genuine environment into which the use of those kinds of munitions would place us. That is to say, we really don't know how to induce the effects for short term in non-lethal or non-damaging ways. We cannot experience what would happen to us if we didn't do it well. Our equipment shortcomings are probably very well known -- the age of the equipment, the availability of it, the ability to train in anything larger than a very small unit, even using such things as tear gas to simulate other lethal gases, is restricted by, among other things, lack of available space on our bases, environmental restrictions, and some outcries we get from the public if this stuff drifts across the fence. It is an extremely difficult problem and I don't think we, to my knowledge, simulate it or approximate it or train in it as well as we would like to.

MGEN Day

That is probably our biggest single weakness because we know that it's one of the strengths of the threat. We know that within

Panel Comment

We follow the same procedure that we do in purchasing training devices for emerging systems. Actually, it's a much easier question if that money is there. Often the money is up front in a system and you're looking for additional money to support current capability, then the question is going to be asked, "how much longer is this weapon's service life going to be? Are you going to get the pay-back, this initial pay-out in the device, if, say, you're talking about a weapon that's going to last three more years. Or is it going to last ten more years?" Those are the questions that have to be answered as to whether it's cost effective or not. As far as the development goes, the process is naturally much shorter because your data is so much better. You've seen what you do well and what you don't do well with that weapon, and where your training weaknesses are, and the analysis that will precede acquisition of a training device is surely simpler than when you're trying to guess how people are going to . . . .

Question -- Cannot be understood

Panel Comment

Well, absolutely. As a matter of fact, TOW is fortunate in another regard. There is a product improvement on TOW known as TOW 2 that is going to be fielded in the Marine Corps in early fiscal 85, if I'm not mistaken. That's a separate acquisition, so there is also the opportunity there to seize on that particular time to say, well, we're buying much improved weapon, much improved optics, let's get a better training device, too. We're also putting TOW on two vehicles, one a light wheeled vehicle and the other a light armored. So TOW is certainly an area where we're more than open to fight a battle to get good trainers.

Panel Comment

In general terms, though, what Alex meant to say was yes. We do have a degree of flexibility and it's largely limited by how much and for how long, as it is with all procurement. We do have flexibility in that regard, for an on-line training device or an improvement to an existing system. We tie very closely with the Army because they have common systems and, of course, NTEC, represented for us by Colonel Castellana, is normally our agent, for the developmental aspect.

Question

I'd like some comments on tactical training devices or devices used at the unit level in terms of portability and how rugged they have to be to meet your needs.

the past six years, or six years ago, we never thought of NBC. We
thought it was a thing of the past and no one would use it before
they would even the nuclear type of weapon. Today we realize that
maybe it will be used and maybe it has been used, particularly in
the past six years. I don't think we've been able to come out and
prove it explicitly, but we do know that we have heard rumblings
from Afghanistan and from Southeast Asia that the threat uses it,
and his surrogates use it. We don't use it. We're not prepared
as well as we should be today, and I mean the entire gamut, not
just the rifleman, not just the Marine Corps, but our Navy shipping,
our aircraft -- that is, predominantly the delivery system -- and I
know that the Army is in the same boat as we are. We're working
toward that, but if there's one area -- and this is one of the areas
that I was alluding to, sir, when I spoke to you a few moments ago
under the tent. That is something that that rifleman has to have.
That is a means of survival; it's the primary mode of survival that
we have to counter if we do go into battle against this guy that
does have the availability of it. Right now, I think it's almost
a position of ignominy as far as where we stand on NBC.

Panel Comment

The biggest problem in the Air Wing primarily lies in the
helicopter crews. We haven't had the equipment to fly with, so
we haven't been able to train. There's a tremendous void there.
We're buying some new equipment now from the British that we
hope is going to be the first generation of a whole new series of
gear to protect helicopter crew members and allow them to function
in this environment. Once we get the equipment, we're going to
have to develop some methods of training with it and, as the
General said, it's a wide open field right now.

Question

Could I ask the panel to comment on our openness to discuss or
to receive some innovative ideas in biological, chemical, or
nuclear training?

MGEN Day

Yes, we're going to be very frank with you as to where we
stand on something. We know that that's a weakness and it's a
heavy weakness. We would expect that same type of input from you
if you have some sort of a solution. We'll talk to you probably
on this subject more than on any single subject that we have, be-
cause it is a matter of survival.

Question

How much flexibility do we have in adding new training equip-
ment to existing systems?

Panel Comment

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devices for emerging systems. Actually, it's a much easier ques-
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for the developmental aspect.

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vices used at the unit level in terms of portability and how rugged
they have to be to meet your needs.

Panel Comment

That's one of those open-ended questions that tempts us to shoot our mouths off. I think it's fair to say that the degree of ruggedness and portability goes right back to the kind of unit and the kind of thing you're talking about. If it is designed to be carried by the individual infantryman, as for example a piece of MILES-related sensor equipment, it's got to be very rugged and quite light so as not to artificially increase his load, an individual man. A similar kind of comment would apply if it was intended to be used with vehicular-mounted things, with aircraft, either helicopters or fixed wing. I can't give you a fixed answer, Doctor, as I'm sure you didn't intend me to, but there would have to be a judgement made about whether it was sufficiently rugged and sufficiently light and perhaps sufficiently inexpensive to be utilized in the area in which it was intended to be applied. If I had to carry it, it would have to have certain parameters. If a transport aircraft was meant to carry it, then it would be differently structured, perhaps. I don't know if I'm addressing your question.

Question

The question I was after was if you have certain training devices that are assigned to a unit and you redeploy the unit, you obviously don't need these to fight your mission and they could be left behind. That's one kind of device and it's one kind of a design. If you want to pack it up and go with it to wherever you have to go, that's another thing. If it has to survive sitting in the mud holding ammunition cases out of the wet, that's a third requirement. That's the kind of thing I was looking for.

Panel Comment

One of the observations that I'd make on it is that primarily, with a couple of exceptions with laser items, the items that actually go on the equipment and are attached temporarily to the equipment are sub-caliber devices, sometimes laser items. These have to be rugged enough to withstand the operational conditions of that unit. Even though they won't be taken to combat, we try and simulate combat as closely as possible in in-field training exercises. The other type of device that we look at is something that could be in a stationary, fixed mode, perhaps a training device that just trains a gunner how to track. It's not put on the tank, not put on a vehicle. It's simply housed in the unit and the requirement for ruggedness isn't there that it is on an item that you actually affix to the equipment.

Question

I wonder if you could address your deployment training requirements. What simulators or devices might be needed when your units are on deployments for the months that they're on ship or onboard?

Colonel White

Perhaps I can at least initiate it. Some of the concerns that we do have are the maintenance of skills during long-term deployment. The unit that I commanded most recently would go out for six months. We would depart our home base, go aboard Navy amphibious shipping, and head on out into the Mediterranean Theater for six months, or in some cases, the Indian Ocean. We therefore would tend to use those things which either are compatible with Navy onboard systems -- and that happens to be, for the most part, an instructional television system or similar audio-visual devices -- or to take with us those sorts of training devices which are designed to be packaged up and taken along. Those which we presently utilize are fairly fundamental -- . . . slide, audio-visually related, mock-ups, or other rather fundamental training devices. We have thus far tended not to take large numbers of simulators with us, with the possible exception of some of our aviation units . . . maintenance trainers, but that would be about it. Anything that we would intend to take would have to be compatible with available space, especially aboard amphibious shipping, for long-term deployment -- which is at a premium, I might add -- and which could be utilized by those people that General Day and I talked about -- the operational commander who doesn't have a whole lot of technical expertise and probably doesn't have any extra time to figure out how to use them. I don't know if I'm addressing your question, but those are general considerations.

Colonel Castellana

Are you comfortable with that, sir?

Comment

Yes, generally. It just seems to me that that's an opportunity to train a great deal, especially if there's a lot of time waiting, which there appears to be. Is there a need to develop training devices or simulators to fit that specific requirement, or are there sufficient available now in the general force to take aboard with you, or what is the direction you need to go in that field?

Colonel White

We're pretty well satisfied with what we have, but if there is one area that we really lack a device in, it's how do you train aboard ship when you're in weather conditions where you don't have a glassy-type sea. As an example, the STAAG that Colonel Castellana just mentioned, where that gunner has to keep those sights on that small target that's out in front of him. If we could come up, as an example, with some sort of container aboard ship that would be balanced to counter any type of roll or pitch that that ship has, that means that we could probably train on a 24-hour level 6 months at a time. The weather takes that away from us. If we go into a

severe condition, then we can't use that type of a device because
we can't compensate for the roll or the pitch of that ship. So
we have to have something that we can train in. As far as taking
the devices with us, within the units that go to the Pacific, again
because of the pacified nature of that ocean, we can train more and
longer hours than they can in the Atlantic, where you have a more
diversified type of sea and a higher sea. We do need to make a lot
of inroads in this, because when a man is aboard that ship for six
months and he gets off for an occasional landing or he gets off for
an occasional liberty, he has a lot of time on there where he should
be training in some aspect. We could go back to World War II, where
they actually had targets onboard ship, where they actually had
semblance of grenade ranges where they threw them off the ship into
areas and used concussion grenades to get the effect. We've some-
how got away from this and yet our need today is probably greater.

Question

The human mind is far more complex than any of the technology
of warfare that we've been talking about. Have you had any dis-
cussions recently on making training itself as a career field
within the Marine Corps, just as communications and aviation are
specialties?

MGEN Day

I think you can get involved in that type of discussion on a
daily basis. We were involved last night on it, in fact, whereas
in the Army it seems like -- and with General Tice a couple of
hours ago -- where the Army can sometimes afford the luxury to
keep a professional trainer in that field. The counter to that,
of course, is that the guy that is the professional trainer, if
he has never been a user, then maybe he doesn't fully understand
exactly what that user wants. If that user can articulate to the
professional trainer, then they can have that arena right there
pretty well closed and it would be very simple. With the man-
power that we have in the Service today, we don't have any com-
pensation for having professional trainers, but I'll defer to the
Board on that because I know they all have their own ideas on it.

Panel Member

If we're going down the line, you'll just get individual ideas,
I guess. Mine is -- and I base this on working on joint acqui-
sition projects -- that you just can't beat the sensitivity to
the user that we get out of having Marines recently returned from
Operating Forces working on this. I've seen it, it's been dis-
played to me, I firmly believe it, and I just would not like to
see a bureaucratic approach replace it. I think you have to have
a feel for what the user is going to do. That's my opinion.

Question

I have one for the panel and it relates to JVX, the follow-on, high-speed, VSTOL aircraft. Where are we and what is our status in training?

Lt. Col. Wagner

As far as the JVX is concerned, I think this is probably as up-in-the-air as anything in the arena right now. I think it's undergoing very serious considerations -- whether the Army is going to be a player -- I don't really believe the Marine Corps or the Navy has enough money to go into full-scale development or R&D. The latest word I had is they are reassessing it, they are having hearings at the highest level with DOD right now, and, yes, the Marine Corps needs it. The 46, which is our middle-range carrier, probably won't last much longer than 93, and that's when they start dropping dead. We've got the 53 Echo, which is a heavy lift helicopter. We have a definite void in the middle-range capability. I fly helicopters. I realize the need for it is there, but it boils down to the bottom line -- money -- and if you can convince somebody in Congress that we need it, more power to you. We'll jump on, we'll build a framp and everything.

Colonel Castellana

Jack, could you give us some of the characteristics that we're looking for in this new aircraft?

Lt. Col. Wagner

Yes, sir. We're looking for an aircraft which is capable of vertically taking off and landing like a helicopter, approximately go with full payload, approximately 500 miles inland if they took off right at the coast at a speed of approximately 250 to 350 miles per hour, capable of carrying 12 to 18 combat troops, put a jeep and trailer internally if you so desire with the capability of lifting some kind of artillery piece. I don't know what the exact specs are, but I've read them and that's very close.

Colonel Castellana

The Marines want to thank you all for being here and for being so open, and I personally want to thank our panel for their ability to address the subjects in a candid and open way. Thank you very much.

SESSION IIA

DEFINING NEEDS OF USERS

Mr. Barry C. Holt

This session is titled "Defining Needs of Users." We will be examining this area from several points of view. Our panel of experts includes a Navy Reserve Pilot, an Air Force Test and Evaluation Pilot, a Retraining Psychologist, and an Educational Specialist. This places us in a fortunate position of being able to draw upon a formidable array of talent, skills, and experience.

Although these gentlemen will raise different issues in their papers they will be presenting, we will find that there is essentially only one question they are trying to answer, and that is how do you buy the right training equipment; what kind of device is required to teach individuals how to effectively operate and maintain a weapons system or one of its components. At first glance, this appears to be a straightforward, simple question, easy to answer. All that has to be done is to build a simulator that replicates the operational environment and teach those tasks which achieve the appropriate behavioral objectives. Many who have had to live with this question through the life cycle of a weapon system program think differently. There are always the doubts that plague one after all the design decisions have been made, the trainer has been fabricated, delivered, and integrated into the training curriculum.

Let's look at some of these problem areas as identified by some of the speakers. For instance, fidelity. Were there too much emphasis placed and dollars spent on making the trainer look like and smell like the aircraft? Couldn't the trainer effect as much learning transfer without some or all of the whistles and bells? Which cues were really needed? How much field of view and scene detail was really required in the visual presentation? Or, given that added fidelity didn't necessarily increase learning transfer, how important was it for establishing user acceptance?

Another problem area -- are we expecting too much of the trainer? Was the right decision made in terms of which tasks should be taught on the aircraft and which on the simulator? Did we place too many design demands on the simulator, such that we made late delivery inevitable?

And a new problem area -- are we incorporating adequate mission logic in the new generation of high technology tactics trainer, such as the ACM? Did we make certain that the trainer is capable of simulating a high priority mission scenario? Were

the aircraft's potential tactics capabilities built into the trainer? Does the trainer have an adequate debriefing and demonstration system?

And finally, were planning and managing procedures adequate? Were relevant operational outcomes initially established and ultimately achieved? Will the trained individuals perform to the levels required of them to attain a high standard of military readiness? Were the user representatives maintained in the loop throughout the development and production phases of the trainer? Were adequate liaison and communications maintained with all project participants, such that no significant inputs fell through the cracks?

All these questions and more will be addressed by our panel members. They will not only spell out the problems in detail, but they will also propose some very interesting and highly viable solutions.

Before I introduce our first speaker, however, I would like to offer some additional thoughts for consideration in the examination of the problems of defining needs of users. I think that it is most important that we don't lose sight of the big picture. We must keep in mind that optimizing our methodology for determining our real training needs is only half the story. These needs, then, have to be quantified and adjusted so that they can be expressed in specifications in contractual terms and stay within the bounds established by funding limitations. Also, we need to strengthen our feedback loop from the field with respect to trainer performance and effectiveness so that we can continuously update and improve our designs, avoid adding the wrong capability, and stay on a course that leads towards maintaining training excellence while simultaneously achieving the maximum return on our dollar.

Although we won't be discussing these matters in this session, I believe that keeping them in mind will help place the presentations you are going to hear in proper perspective.

I have the pleasure of introducing our first speaker, Lieutenant Colonel Ron Olsen. Colonel Olsen is Deputy Chief of the Support Systems Division of the Air Force Test and Evaluation Division. He was formerly Chief of the Simulator Branch at AFTEC and the Test Director for the A-10 simulator operational test and evaluation. Other work in simulators includes a tour as a simulator instructor at the 375th Aeromedical Air Lift Wing and a study using a NASA . . . Differential Maneuvering Simulator to develop air combat tactics for helicopters. He is a graduate of the United States Air Force Academy and the U. S. Navy Test Pilots School. The title of Lieutenant Colonel Olsen's paper is "The View From the Other End of the Microscope or I'd Rather Be Flying."

Lieutenant Colonel Stephen R. Olsen

There's no mistake on your program. My name is Ron Olsen. My parents were a couple of vaudevillians who decided my initials ought to be Standing Room Only, and they hated the name Steve, but they're very happy for the three people who are standing in the back of the room today.

The title of my paper, as he said, is "A View From the Other End of the Microscope." For you in the back of the room who can't see my five . . . members up there, we've got one saying we need more SIMS, save money. The one in the middle there had too much turkey and beans and carrots and he's sleeping, and there's less flying and save gas. The picture is saying -- and we forgot the other part, "I'd Rather Be Flying".

The scene is a Tactical Air Command Base somewhere in the southwest. A new mission simulator has just arrived. The building is new, has efficient air conditioning, plush carpets, comfortable briefing rooms. You know it's really a modern place today because it has those wipe boards with the magic markers, which makes it really good. It has the latest technologies incorporated in the student/instructor stations -- motion, visual, oral, voice masking, automatic instruction, programmed emergencies and a whole host of other goodies. Still, the pilots avoid the facility like the plague. Having a session in the simulator ranks somewhere in the desired activity list right below child support, alimony, and knee surgery. How can this be? We've spent five years and $100 million to develop, produce, and field this simulator. It really seems to me that something funny has happened along the way, because I remember my own initial experience with simulators with a great deal of fondness and even a certain amount of respect. I didn't have much time in the simulator during pilot training, but once I got to my first assignment at the 375th Air Medical Evacuation Wing, we got simulator training in the old Convair simulator for the T-29, the C-131 -- two props, two wings, . . . landing gear -- you older fellows may remember it. As I understood it then, the simulator that we had had been built in the early 50s, it was condemned in the late 50s, and we were using it in the late 60s because it was the only thing available. To make matters worse, it was designed for the Convair 240. Now, the Convair 240 and the nine models of the C-131 and T-29 were basically the same aircraft. However, there were just enough differences, primarily in the electrical and the hydraulic system, to make trying to teach all those models in the same simulator an interesting experience at best and a nightmare at the worst.

Talk about this simulator doesn't fly like the aircraft, in the Convair simulator, non-fidelity was an art form. It's worth a few minutes, at least for me and I hope for you, to digress and describe this particular simulator. It had what I would call a first generation visual system. In other words, frosted windows

and a rheostat to turn the lights up and down. You simulated fly-
ing in clouds by turning the lights down; heavy clouds, lights fur-
ther down; flying at night, lights off; flying in thunder storms,
lights off, strobe lights flashing; and breaking out of a ragged
cloud deck, you could do that by turning the lights up and down.
I know there must be a couple of visual engineers in the audience
and I know you're taking notes and eating your hearts out at the
class of this system.

The simulator was not lacking in oral cues, either. The engine
soundtrack, I'm sure they got from one of those World War II moves
when 300 B-17s are flying over Potsdam. Changes in power were re-
flected mainly by changes in volume. Crash noise was a real
classic -- it had to come from an Abbott and Costello movie when
the delivery truck goes crashing through the window of the store.
About the only part they cut off it was the woman's loud scream
at the end, a long pause, and the sound of a single breaking glass.

There was one way that I know this simulator was way ahead of
its time and that was in the area of nasal cues. Now, I've seen
a lot of simulators in my time that really stunk, but this one
was the only one I ever knew had nasal cues. It was associated
with simulating electrical fire. What was done was you took a
piece of insulated wire, which was provided at no charge by the
Government, and you connected it between two terminals which were
placed next to the intake for the air conditioning duct. Power
was then applied, of course the insulation burned off, and the
inevitable smoke went into the ducts and up front with all the
simulatees. Now, there's realism, imagination all rolled up into
one in the 1950 simulator.

This greasily transitions me to the instructor's station,
another marvel to behold. If the engine sound came from a World
War II movie and the crash sound came from an Abbott and Costello
movie, the instructor's station came from the Rebirth of Franken-
stein, because what you had was about a 12-foot long panel up
there with between 500 and 1,000 toggle switches, knobs, and dials.
From there, the instructor orchestrated the mission. No CRTs,
no keyboards, no light pen, no programmed emergencies, no auto
demo -- how could he survive? He did and he did a good job. As
a matter of fact, he was busier in back trying to run that con-
sole than the guys up front getting the instruction.

Now, what about fidelity? It really is a laugh. The simula-
tor compared to the aircraft kind of like a . . . does to a Porsche.
You fought the simulator all the time. Talk about over control --
now, that's all you did in the simulator. Holding heading was
like balancing on a beach ball.

Now what you may be expecting to hear is how much we hated
the simulator and with all the improvements we've had since then,
there isn't any reason why pilots shouldn't be fighting to fly in

our simulators. Well, actually, what I'd like to say is we loved the simulator and there are a lot of reasons why pilots don't want to get in simulators.

Now, what was so wonderful about that particular simulator? First, the emphasis was that that simulator was only part of an entire ground training program. The simulator was merely used as a tool in a refresher course that emphasized system operation, emergency procedures, and instrument flight rules. Second, the simulator was used to make what flying time we did have more effective. Even in 1967, there wasn't an abundance of flying time. It was never considered that we would use the simulator to replace flying time. We needed the simulator time to make what flying time we had more effective, productive, and safe. Third -- and this goes along with one and two -- we didn't worry about fidelity as an end. Sure it handled poorly. We understood that. But we knew if we could fly the simulator and handle the emergency instrument procedures, the real thing would be a breeze and from experience, I can tell you that was true. Fourth, and probably one of the most important things, was the ability and attitude of the instructors. The simulator instructor position was really a selective position and the guys that served as simulator instructors had the inside track for good report cards and promotions.

So the point is, for years we've been meeting like this and we've been telling each other what wonderful things we're doing, what wonderful things we're going to do, and what wonderful things we've done in the past for the simulator world. In the process we have looked at the pilot through a microscope. We analyzed him, scrutinized him, studied him. We studied his aircraft, studied his mission, we've even studied his bodily functions. We've made great strides in technology -- digitized computers, expanded fields of view, increased resolution. We've really focused in on fidelity. Our reward? We've got a pilot who'd rather go play Pac Man than train in our $10 to $100 million electronic games. Have we done something wrong? If so, what? How can we do it better? Certainly, with the quality of equipment we've got, our program should be able to easily exceed the effectiveness of former programs like Air Evac. To me, the problems are observable, predictable, and correctable, but it isn't going to be easy.

The problems are tied up in four words, none of them four letters, and you can read them as well as I can. There isn't any one sector that can be identified as the guilty party. You've all had a part. This includes the developers, the contractors, the acquisition agencies, the Pentagon, Command Headquarters, test agencies, requirements people, and yes, even the fliers themselves.

My first word is over-estimate. Specifically, the simulator's capability to meet all our needs in a certain limited period of

time. To me, this tendency started with the Arab oil embargo in 1973. Did you ever notice how fashionable it is to trace a problem back to the Arab oil embargo? I'm not going to be left out. Up until then, simulators had been going along fine in their proper role and gaining in capability. Then someone got the brilliant idea that we could use simulators to replace flying time rather than just increasing the effectiveness of it. Therefore, the more we used airplanes, the less time we had to fly and the more gas we could save. The conclusion was that simulators were pretty good but with a little good old Yankee ingenuity, we could make it so the pilot would never have to leave the ground, except in an emergency, of course.

This whole thing led to a flurry of technological efforts and flight hour trade-off studies. Some elements of the Air Force committed themselves to giving up flight hours in exchange for certain simulator capabilities. These estimates had been based on projections of expected technological advances. Unfortunately, the technology was not all that was expected and what there was took a little bit longer to do than they thought it would. Five years later, the simulator arrived. It's two years late and the flying hour cuts took place two years ago. Unfortunately, the cost of a full visual capability was a little bit more than we expected and that's been cut from the program. Also, the flying qualities aren't quite the same as the airplane because it was built on design data and the flight test data wasn't available until after the critical design review. That took place four years ago, but we couldn't afford the cost growth to incorporate the flight test data into the simulator. The other thing is perhaps we didn't have enough data points; the sampling rate was too low, too high; the iteration rate was too low, too high. There are any number of technical reasons why the simulator wasn't quite what was expected or wasn't delivered on time. The base newspaper just came out -- "The simulator has just passed reliability testing with flying colors." However, half an hour into the first mission, it has five computer halts. These are explained as merely software glitches that weren't reflected in the reliability testing because you see, Mr. Pilot, software doesn't fail. I could go on and on, but we've been with this dead horse a long time. Overestimate is the word.

The second is under-anticipate and it could also be three words -- lack of planning. It seems in the last few years, many simulators arrived on base just about the time we started building the training syllabus. There seems to be minimal thought placed in, number one, developing a syllabus and then two, requesting a simulator with those features which will best fit with the aircraft.

Over-emphasize is the third word and fidelity is the one that goes along with it. Simulation is exactly that. Simulation. By definition, no simulator will ever have total fidelity. Furthermore, total fidelity doesn't guarantee an excellent training

device. The real airplane has complete fidelity, but is only an excellent training device with a confident instructor. Our preoccupation with fidelity as opposed to training capability has driven up the cost and complexity of simulators and actually detracted from training capability.

The last word is over-complicate and it's really a synthesis of the other three. Our preoccupation with fidelity leads to expensive systems that are difficult to maintain and costly to operate. Our failure to design a training program in advance of the simulator leads to the "give me everything there is and we're bound to have an effective training program" approach. The problem is that it's always too expensive, something always get cut, and there's no way to evaluate what's most important. A good example is that many of the instructor stations have expensive, underutilized systems. Had there been a development of the training program first, these under-utilized features could have been identified and the funds diverted to other, more valuable features.

Those are the problems as I see them. Anybody can be a critic. What do we do to make it better? The first recommendation is, of course, to design the training program first. The simulator should then be appropriately integrated into that syllabus. This is not new advice. With this kind of approach, you can take a look at the task you need to train most and let the developer work to obtain that capability. Kevin Smith and Charlie Beagles will talk more specifically about how to go about doing that.

Second, be realistic with schedules. The acquisition agency typically puts out a request for delivery of a simulator in three years, knowing this is an unattainable goal. The rationale for this procedure is that trainers are historically late and we wouldn't want to ask for them later because then they'll be even later. The contractor then signs up to that goal saying, "Oh, yes, I can make that," knowing it's strictly a success-oriented goal.

Don't forget software, documentation, spare parts. As a pilot, I must admit these are fuzzy-wuzzy areas in my mind except when the simulator doesn't work, breaks down, and can't be fixed. Mumbo-jumbo about reliability figures do not include software failures as failures. The level of documentation order doesn't cover this and this part is down in the simulator but it won't be available for six months doesn't build confidence in the pilots who you're trying to impress with the effectiveness of these devices.

The last is probably the toughest one and the key to the whole program. Obtaining good, motivated, exceptional instructors. This involves changing an entire attitude about simulators. In many cases, simulators have become the dumping ground for pass overs and if a guy is not passed over for promotion when he gets there, he soon will be because his accomplishments aren't recognized.

Simulators have considerable capability. They can enhance and improve any good training program. The important thing to remember is they cannot replace an airplane nor can then enhance a poorly conceived or poorly executed training program.

I see by my pen that I've smartly arranged this so there will be no time for questions.

Mr. Holt

Thank you, Ron.

Our next speaker is Mr. George Barcus. Mr. Barcus is currently an Educational Specialist in the Surface Analysis and Design Branch at the Naval Training Equipment Center. At the time that he prepared his paper, I think George was with the PM TRADE, also as an Educational Specialist.

Mr. George Barcus

Those of you who are familiar with my normal delivery style will notice a distinct lack of snappiness today. I have a cold, so I decided to make this a little shorter than I originally intended.

The things that I'd like to talk about today, as my title implies, is the user's role in major training system acquisitions and this is perceived by the developer. To clarify it a little bit more, before my present position as an Educational Specialist in the Surface Analysis and Design Branch of the Naval Training Equipment Center, I worked in the Land Analysis and Design Branch and at that time I did some work with PM TRADE. From some of the work that we did putting together some training acquisition programs for some major weapons systems, we came together with some observations about the user in the entire cycle and I'd like to mention first, from our dealings with the users that we've worked with, I'm not mentioning their lack of these points. Sometimes the fact that these points were evident in the dealings with them, we thought it would be helpful to maybe go over this and talk a little bit more about it.

I would like to think that some of you will go away from this particular presentation and say, "Gee, that makes sense." That's in fact what I intend. I'm not going to talk about anything terribly mind-boggling here. I just want to go over some points -- it seems it happens we get so wrapped up in the technological wizardry of all the things we're dealing with that we lose track of just the common sense approach of dealing with other agencies and keeping those communication channels together. I'll not go through in the kind of detail that I did in the paper about the acquisition cycle participants, but I will just mention those four that I was interested in and that I talked about.

The first one is the training developer. That agency is the one that's responsible for the formulation of training concepts, objectives, and requirements for the training of U.S. Army forces. In most instances, it is a U.S. Army Training and Doctrine Command that we refer to as TRADOC.

The material developer is that element responsible for research, development, production, and production validation of the training device. In most cases it is the Project Manager for Training Devices. Also working within this agency is the Project Director at PM TRADE.

We'll be talking a lot about the user or the proponent school and this is the designated command or organization that is to receive the training system or device.

Finally, the contractor. We will refer to this as the company that has a contract with the procuring activity for the design, development, and manufacture of the training system. This participant builds the hardware and develops the training scenarios and software according to the specification requirements of the contract.

Now, many, many texts have been written trying to explain what the training device acquisition process is and everything that goes on and how it's handled. I'll not try to do that here. I will mention the four particular phases that we're interested in looking at. The first one is the need identification, the concept formulation phase. This is where training voids and new training needs are identified by the training developer. The demonstration and validation phase is where technical concepts are validated to determine if they fulfill the needs and voids identified. Full-scale engineering development phase is where the training device or system is fully developed, engineered, and tested and the decision is made whether or not the system or device is acceptable to meet the requirements. And finally, the production and deployment phase. This is where the training system or device is procured and distributed. During this phase, individuals or groups are trained in its use and logistic support is provided.

This is the thrust of what we'd like to talk about today. This is the user's role in this entire acquisition process. I'd like to first mention that from the developer's point of view, it is always considered highly important that the user take an active part from the very beginning of the acquisition cycle. The user should be involved from the early stages of requirements definition and TDR development up through and beyond the actual design, development, acquisition, and delivery of the training system or device. We've all heard the stories about training devices and training systems being developed, procured, delivered and not used to their fullest potential. Hopefully, involving early on the user in this cycle will help those surprises be a

little less when the system is delivered and will let them be more knowledgeable and eager to use the system when it does arrive.

The user's role also incorporates the development of front end analysis. The user's role begins with the initial identification of a training need. The complete FEA is needed to address the who, how, when, why, and where aspects of meeting this training need. As was mentioned in the first presentation, it is first necessary to determine what the training requirements are before we go out and build a training system to meet them.

We also look to the user for input into task and skills analysis. As part of the front end analysis, it is usually necessary for inclusion of a task and skills analysis of a present or nearly deployed weapons system and this is needed in the development of the required training device. A lot of times, the way this material was put together early on will help the acquisition and the development of the training system later on.

It is necessary for the user school, and really, all participants of the training cycle to maintain review schedules throughout the acquisition process. Also to provide knowledgeable decision makers. It is hoped that those in attendance in project review meetings not only be knowledgeable about the aspects of the task that they are responsible for, but also carry the proper authority to help make decisions at those meetings.

And finally, work closely with all participants. It is also the user's responsibility as well as the material developer and all other participants in the cycle to maintain that communications link between all segments of the acquisition cycle and keep accurate records of decisions made. Many times, information is passed back and forth between agencies and it has a way of being either distorted, forgotten, lost, or misinterpreted and it causes a lot of time, a lot of trouble, and a lot of lag time being spent trying to keep things together. Keeping records at meetings, I believe, can be a very big help in making sure everyone understands what's going on.

What are the requirements for success? We've talked a lot about establishing this communications link. Working with the Project Director is suggested to establish clear lines of communications, record and note participants, and something as common-sensical as keeping track of those participants, where they reside, where they work, what their phone numbers are, what their addresses are, and making sure that they're getting the information that is required and getting it in a timely fashion will go a long ways in keeping the project on track. Also, we need to identify appropriate participants, know who the team members are, and clearly define the chain of command each works within. This will help with problems of trying to decide who is responsible for which task. Clarify areas of responsibility. Know who has responsibility for each

task required, and make sure each participant understands his or her role. Encourage input to decisions. Clarify decision points and who has input into these decisions. Encourage those responsible to supply timely input. Many meetings have come and gone where decisions were necessary to be made and the proper participants were not there. It's very frustrating when a decision could be made and the project could be moved on in a timely fashion but yet, for lack of someone being in a decision position and not there to help make that decision.

Maintain timely review schedules. Establish clearly defined review schedules. Remember to make them realistic, as was mentioned earlier, and stick to them. Over and over again we let schedules slide and projects will back up. Update requirements as needed. To assure a usable end item, update as necessary as the knowledge base about training requirements needs expand.

To go back and talk a little bit about our front end analysis work, that is a document and a series of analyses that need to be fine tuned as more and more information becomes available about the training requirements and the training system to be procured. We should never be working at the end of the cycle with the same information we started with. We should be updating that information constantly and really asking the question, are we developing the training system and the training device that will meet the user's requirements.

Finally, some suggestions for improvement. To be able to ask the user or proponent school, to be able to maintain the schedules of review, and to take care of all the tasks that are necessary we must provide the resources and personnel required. To be able to perform the job at hand, adequate resources and personnel must be made available at the user school to supply the information needed in the form of front end analysis materials, task and skills analysis, tactics, and related concerns.

I might also mention the need to establish what we've referred to as a corporate memory. Allow for personnel turn-over -- and we've all had to deal with this -- when people come in the programs, people leave, and we have that learning curve problem. If we were to allow for this personnel turn-over by installing a system of corporate memory by bringing new participants up to speed and re- duce the learning curve. Keep track of the information that people have done previous to new personnel coming onboard. Keep those team members informed.

Provide decision-makers. Provide personnel to attend project reviews who have the authority to make decisions. This will help decrease the number of deferred action items. Time after time, action items are lined up, no one there to make a decision, wait until the next review -- lost time.

And lastly, improve communication. To help make the training system acquisition process a success, strengthen the communication link between all participants.

As I mentioned earlier, nothing that I've said here is terribly mind-boggling, but it's kind of nice just to go back and remember -- to be able to keep programs on line and keep time schedules moving along, this communication link between participants is vitally important.

I apologize for the cold today. Thank you.

Mr. Holt

Thank you, George.

Our next speaker is Commander Kevin Smith. Commander Smith is a Reserve Officer, presently on special assignment to the Commander, Fighter Airborne Early Warning Wing Pacific as a Special Projects Officer within the Training Department. He is currently the Operational Project Officer for the development of a performance measurement system for the Tactical Air Combat Training System and the device 2F112, which is the F-14 tactics simulator. Graduating from the Naval Flight Training in 1965, Commander Smith spent 14 years on active duty in various assignments, flying the F-8 CRUSADER, accumulating over 24 hours in type. His major fleet assignments included Officer in Charge, Light Photographic Squadron 63, Detachment 1, deployed on USS CONSTELLATION, as well as numerous other squadron-level department head positions. When not performing his Naval Reserve duties, Mr. Smith in civilian life is employed as an airline pilot and in addition, is involved in work relating to mission and operational analysis. The title of Commander Smith's paper is "Save Our Simulators (SOS): A Distress Call From An Operational User." Commander Smith.

Commander Kevin M. Smith

Thanks, Barry.

This paper this afternoon is about simulation in particular and training systems in general and concerns ways to enhance their training value. In this paper, I identify significant problems involving efforts to employ advanced simulation systems and then I go on to propose a new conceptual approach to the design of such systems in order to make them more user-oriented. Finally, I include, in general terms, an example of a possible application of the proposed approach.

Now, why did I write the paper? I wrote the paper because I felt very strongly that there is an unfavorable trend developing and that is, rapid technical development is proceeding without due regard to critical mission requirements. Thus, many of our

advanced training systems are not providing for the desired training return on investment. Ron Olsen covered some important problems in simulation in his paper and I'm not going to dwell on them very much and beat that dead horse again. I'm just going to give you one example of what I'm talking about to stimulate some thinking. In a recently introduced full mission simulator, a major discrepancy is the inability to run desired scenarios due to inadequate design attention to this area. Now, this kind of thing is most distressing to us, not only because it detracts from training but because it's also completely avoidable. We had the technology, we had the knowledge, why didn't we do it?

The root of the problem, in my view, is that insufficient attention is being paid to such important front end analysis items as mission requirements, critical mission areas, and instructional design features. I feel our system is out of balance. While the technical is receiving adequate attention, front end analyses designed to specify critical user requirements is most often either superficially addressed or totally ignored. One example of this is that some people think a mission analysis is going out and interviewing about a half-dozen air troops. That's not mission analysis.

The missing ingredient, I believe, is an enduring linkage which translates mission requirements into technical design criteria, or in other words, enables our superior technical abilities to provide for the enhanced mission performance. I think we need clearly a change of mind set -- that's pretty strong, but I guess I want it to sound strong. I'd like us to move from an exclusive technical focus to a broader view which embraces mission and instructional requirements as well. Specifically, I feel a mechanism is needed to spotlight critical mission areas so that appropriate technical and instructional resources can be brought to bear to enhance performance, specifically in these critical regions.

Now, unfortunately, the means of translating mission logic into systems design features is really not well understood and I think that's the crux of the problem. The need for having unambiguous and comprehensive understanding of the cognizant mission is clear, yet an acceptable methodology is not available. Now, in addressing this problem, I have outlined a proposed methodology shown here which I call, for want of a better word, structured approach to advanced simulation design. This scheme, which I will cover very, very briefly here -- I covered it more in depth in the paper and still that was a broad brush effort, too -- commences with a formal analysis of the mission and this details mission scenarios, threat-imposed constraints, and specifies critical task requirements. The next step addresses candidate instructional methods versus mission objectives in order to develop a feel for and narrow the analysis to those areas most pertinent. That's kind of a funnel. Step two is really kind of a funnel. ISRA is a term that I've come up with -- instructional systems requirements analysis. We can call it anything, but it's really a funnel to

start a focus. In the third phase, mission objectives relating to a candidate instructional method are prioritized in order to spotlight critical design features which promise the greatest training return on investment, or in other words, step three is the spotlight.

Now, a little more on priority analysis. Specifically, task modules embedded within a mission objective are rated according to (1) their contributions to the success of the mission -- and that's on the Y axis, and (2) their relative difficulty, on the X axis. That's task difficulty. So you have two dimensions that you're dealing with here. The priority analysis, then, enables design teams, I believe, to legitimately concentrate on those areas that will contribute the most to mission success. In other words, do we want our advanced simulators to be able to train crews in inflight refueling or in advanced tactics, given the choice and given the fact that we are constrained by cost and computer space? Do we want to load our simulation computers with air refueling algorithms before we address the more tactically difficult areas of air combat maneuvering or threat countermeasures? Utilizing a priority scheme, such as this depicted here, we can more effectively examine the trade-offs, both technical, cost, and mission performance. I'm not saying we don't need to simulate air refueling. I'm not saying that. What I am saying is that design decisions must not be random but must address in a structured way legitimate user requirements. Another way of saying it is, let's address the most critical areas of the mission first -- put our limited resources there, and then if we have left-over resources, we can simulate these nice, pretty areas that may not be tactically significant.

Now to regress a moment. In order to realize maximum value from the foregoing methodology, I think that we first must lay some ground rules and they are this. I think we need to come from the perspective that we need complete training systems. These hybrid systems should include hardware and operating software, as depicted there, which is generally treated adequately now. Also, curriculum performance measurement systems and some kind of a training management capability. Unfortunately, many design teams still have the tendency to direct most of their attention to the hardware -- the box all the way on your left -- with only a superficial look at the other equally important areas. Thus, we rarely build complete instructional systems. We have, it seems, a double edged problem. On the one hand, we do not understand and thus adequately specify mission requirements. On the other hand, we do not, in many cases, build complete training systems.

The problem, I think, and the one that influences every element of the system, remains the inability to adequately examine the mission and translate this mission logic into design criteria. We must first ensure that critical mission requirements are formally addressed. Then translate these critical mission needs into design criteria, military characteristics, specifications, or what

have you, and finally we must build and deliver to the Fleet, in my opinion, complete turn-key training systems.

In order to do this, however, we need better tools, the most important being a formal means to analyze the cognizant mission -- and that's the reason why I'm up here. Once we do that, additional work is also needed in the other shaded areas, such as informational display technology. That's an important issue that needs to be treated. Also performance measurement. Performance measurement will be treated in this symposium, I understand.

In summary, providing design teams and fleet project teams with appropriate mission logic, coupled with the mechanism to focus attention and resources on those areas promising the greatest training return on investment is, I believe, the critical task at hand and is my challenge to both government and industry. No longer can we design systems exclusively from a technical specification document and no longer can industry hide behind such a document. We need and we must have complete training systems designed to satisfy critical mission requirements. I want to stress that last point -- and must satisfy critical mission requirements. Both government and industry need to work together, starting today, to save our simulators.

That concludes the formal part, but to start discussions and we have a few minutes, I'd like to get some dialogue going. I would like to propose some action items. One, for the acquisition agencies to improve or develop a fleet project team guide or manual to include a methodology to (1) analyze critical mission requirements and (2) translate these requirements into technical design criteria. The reason why I say that is because the subject matter expert is a raw entity. He needs to be helped and he frankly needs a little bit of assistance and perhaps some training. The subject matter expert is not a technical expert; he is the mission expert -- the individual who is familiar with the mission. You've got to be able to talk to him. You've got to be able to get him to articulate clearly to the acquisition agencies and industry what he needs, what is his critical mission requirement. And justify that. That's what we've got to do in the military. We've got to justify why we need something.

Two, I would like to propose that a companion manual or guide be developed for industry. That perhaps could cover similar subjects but include a more in-depth treatment of cognitive psychology which is a budding discipline, and also human factor lessons learned.

That basically concludes the brief. Are there any questions or comments?

Question - Cannot be understood

Commander Smith

No. If you notice the graph, I am working in those two dimensions. You mentioned those two dimensions, but they have to be collated or they have to be analyzed as one relates to the other. If the thing is important from the mission perspective, to arrive at a high priority rating it also has to be difficult to do. So you have those two dimensions working together and then if the thing is critical to mission success and it's also difficult to do, then it falls on the upper right-hand quadrant of the priority scale and that's the guy we have to address today. Right now. Now, the things that fall on the other side maybe can wait or we can do some more exploratory research in those areas and what have you. If the thing is difficult to do but not terribly important from the mission success standpoint, we can spend some time trying to figure out how we can aid the pilot in that area, do some research on aiding and automation and what have you.

Question

I just have a comment or two. I haven't had a chance to really read your paper in any depth and I watched you go over your methodology and I can see where it would be very useful to apply that in the actual development of a simulator or a . . ., an engineering change proposal. Do you have anything on the boards to do that, to try and test that methodology and to bring in the user as an integral part of a design team? Because I think that's where the shortfall is.

Commander Smith

And I agree. I went over to NTEC yesterday and discussed these notions and some of these recommendations with them, and they were well received. It's still a little bit early to define an action plan and all of that, but I think we're moving in that direction. I sense that we are. Now, locally on the staff, in my efforts to build a performance measurement system for the TACs range, I'm using some of this methodology, not only to help us analyze the mission and prioritize it and design the systems that are really going to speak to the needs of the user, but as kind of a test bed to test out the methodology. I'd like to see it used and enhanced, frankly, and it needs to be enhanced. I still have difficulty with that translation. Once you know what the mission requirements are and have prioritized them, there needs to be more work and I mentioned this in my paper. There needs to be more work in being able to translate that into design criteria for the particular system that you're talking about. That's where we should put our heads together and work on that. I'd like to see some formal effort. I'd like to see a formally funded program to do that and basically that's my challenge to decision-makers out there in industry and in government. Work together and let's get a program going so we can do that.

Question

I've often suspected that we would get much better simulators if the simulation engineers would actually go out into the training schools and operational units and spend enough time there. They'd come back with a real understanding of what the operational needs are, what the instruction techniques are so that they can know what the issues are and be in a better position to make engineering trade-off as to what's required. Could you comment?

Commander Smith

I fully agree and support that. In fact, I would like to take that one step further and issue an open invitation to any simulation engineer that wants to, call me up and I'll give you a ride in the 2F112, which is the F-14 full mission simulator that we have out there at Miramar. It's a dual cockpit -- I could put you in the back seat -- we could go and fight a MIG-21. I can show you the problems in simulation and I most importantly can show you the problems in the mission so you can get a feel for the mission. In fact, we did this in the project that I'm working on. I took three people, and they were in various areas in the hierarchy, through a 1-V1 scenario in the 2F112 and it was really an eye-opener. That's a tremendous suggestion. I think we need more of that. Come on out. Don't be afraid of it. It's not that bad. In 5 minutes, basically, you're used to the motion. My phone number at the Staff is 619-271-2120, and I'll be glad to take anybody out there and give them a ride and go through the mission scenario with them and explain about the mission and how this translates into simulation. One of the biggest problems we have is that we've got a simulator, we've got an instrumented range, we've got all these devices and elements and we don't have an integrated system. Nobody looked at integrating an air combat simulator with an air combat range, and that's quite a challenge. There's a lot of work there.

Question -- Cannot be understood.

Commander Smith

It needs a lot of work. I'm not an expert, I'm just an airplane driver, but I was talking to Commander Chuck Hutchins just a few weeks ago, who is up at the Postgraduate School at Monterey, and he told me that where we need to be headed on that is to present context analog displays to the pilot using the latest concepts in cognitive psychology. I referenced a paper in my paper and I think it was National Research Council or something like that. They did a study for the Air Force on automation and they made some very good points. One of the challenges that we have is to be able to understand the mental make-up of the pilot, how he views the world. Does he view the world in a digital way? No. So that if you throw digital information on a . . . that does him little good because you've got to translate that. If you throw context

analog information on the . . ., that's better. That's not per-
fect, but it's better. The closer you can get to the way he thinks
and the way he views the world and views the mission, the better
your informational displays are going to be. That should be a
whole new subject. That should be a whole new discipline because
now that we can produce these displays, how do we produce them?
There is tremendous controversy in the F-18 cockpit informational
displays now. This goes back to one of the problems that I men-
tioned earlier -- getting the subject matter experts to be able to
articulate mission requirements in a clear way so the designers
can go in and provide the guy with what he needs.

Question

. . . . . community is that the acquisition agencies and train-
ing system manager agencies has been exactly the opposite direc-
tion, that the involvement of the end user in the acquisition pro-
cess is viewed somewhat as a complicating factor rather than some-
thing to be desired and I wonder if some of the members of the
panel would like to comment on that.

Commander Smith

That's kind of the area that I've been addressing here in the
paper. I think that the user needs better analytical tools. If
we're going to designate fleet project teams, and that's kind of
a formal body of subject matter experts for a major acquisition
program, if we're going to designate those people we've got to
train them.

Panel Member

I'd like to comment on that. Did you say you were with the
P-3 community?

Comment

No

Panel Member

I thought there was a very active dialogue between the producer
and the user in that program since its inception back in 1959.
It's been my experience that throughout the development of what
we used to call then the military characteristics up through the
development of the performance investigations and once we got into
fleet usage, we looked at whether or not some of these changes
that were coming downstream -- we looked at the significance of
the training value associated therewith and we discussed openly
and in great depth with the subject matter experts. I'm kind of
taken aback by what you say here.

Comment

It's an involvement that's being harder and harder to maintain.
. . . .

Panel Member

Why do you feel that is? Are the users not receptive or do
you think it's a conscious effort not to involve the user. Is that
the thrust of your comment?

Comment

Yes, sir.

Panel Member

Has anyone else experienced that? Is there a real conscious
effort not to involve the user because it muddies up the water?
Is that the feeling?

Comment

Only the 1400 community.

Commander Smith

That would be my challenge to industry and the acquisition
agencies, to establish a free-flowing dialogue with the user. Now,
that's not easy because he's jumping around, but it's got to be
done and I think with these tools we've got a starting point,
a foundation. And if these tools are not to somebody's liking,
let's come up with better tools and I'm sure that better tools
could be developed. But we need some kind of a tool to develop
a starting point from which we can then direct our attention at
the most important areas in the mission.

Mr. Holt

Maybe the thing to do, then, Kevin, is to take you up on this
fleet project team guide. Maybe that's the document we need.

Commander Smith

I think so. I think that's where we need to start today. If
we're really serious about this, I think we can do something
starting right now and that's to improve the fleet project team
guide or develop one if you don't have one in your service, to
really get to the bottom of the problems that I talked about and
also the problems that you're addressing here. Make it a formal
requirement to deal with the fleet project team. That's an item
in the management plan.

Mr. Holt

Thank you, Kevin.

Our final speaker is Dr. Charles Beagles. The paper to be presented is a joint effort by Dr. Beagles and Dr. Andrews. Dr. Beagles is a psychologist in the Analysis and Design Division of the Naval Training Equipment Center. He has worked in the area of training analysis and design since 1976. His research interest is in applying basic research and information processing to instructional systems. Dr. Beagles holds a Ph.D. degree from the Florida State University in Educational Psychology. Dr. Andrews is a psychologist, also, in the Human Factors Laboratory at the Naval Training Equipment Center. His work at the Center has included instructional systems development, transfer of training analysis, and training device evaluation and instructor-operator station research. He received a Ph.D. in Instructional Psychology from the Florida State University in 1980. The title of the paper to be presented is "Identifying Necessary Goals and Objectives for Training Systems; A Needs Assessment Approach."

Dr. Charles Beagles

I'm glad that Barry mentioned Dee's name so you'll know he shares in the culpability for what you're about to experience. The reason I'm here instead of Dee is a simple one. I lost the toss of the coin. So he'll answer all the questions.

The presentation has four parts: the introduction or statement of the problem; the presentation of the needs assessment model; how the model functions; and how it applies to military training requirements.

The problem has been well stated by Commander Smith and Colonel Olsen. Essentially, we're developing training devices and training systems that are functioning at less than optimal efficiency. One reason for this is a confusion of training means versus training ends in the design process. The training means or the focus on technology many times drives our planning and we lose sight of important training results that we're trying to establish. The theme of the presentation is that this means versus ends confusion can be reduced with good planning that is based upon accurate goals and objectives for the training device or system.

From a needs assessment point of view, good planning must address three questions, specifically and exactly, where are we right now, exactly where do we want to be, and why do we want to get there. The fourth question of how we get there comes much later in the planning process.

The organizational elements model that we plan to present today has two main features that help answer these three critical

questions at the beginning of the planning process. The two characteristics of the model are the way it defines a training need and secondly, the reference point for conducting the needs assessment. That reference point is external to the training system and resides in our world with the user.

The organizational elements model defines a training need as a gap in performance results. This is a measurable difference between where we are right now and where we want to be. Emphasis on measurable quantities and measurable statements, quantifiable results, is critical. One reason for this measurability is the comment that Barry made in his opening remarks. We've got to have this kind of measurability and this kind of specification if we're going to do contracting work and if we're going to evaluate the system.

This focus upon the gap and results between where we are and where we want to be also ensures that solution statements do not get inserted prematurely in the planning process. For example, what we need is a CAI system or what we need is a certain kind of simulator. That is not a true need. A true educational need would be, the students cannot see or interpret a radar blip in the proper manner. What we want them to do is to be able to interpret that within so many seconds after it appears. Then we'll determine how we're going to go about teaching them and closing that gap.

Needs assessment is a process of determining what is, what should be, prioritizing these gaps, and then selecting the most critical ones for closure. To accomplish this purpose, the organizational elements model has five elements that work in concert. The first element is the input. These are the raw materials that the training system uses. Second is processes. These are the how-to-do-its or the means that we use to accomplish the results that we're after. The product is the first result. The product is a "thing" of the training organization. The outputs are the deliverables of the training system. Most commonly, these are graduates. The last result of the training system is the outcome and this is the most critical. The outcome is the impact that the deliverables have on the community, external to the training system. The first four elements are internal to the training system; the outcome is external. The first two, inputs and processes, are organizational efforts. They are not results. The last three, product, outputs, and outcomes, are results.

Now, let's see how all of this works together in conjunction with how the model defines the need and this external effort, outcomes, function. We said that to solve our problems we need to know the answers to three things: where we are exactly, where we're going; and why. This little two-dimensional matrix suggests a way to proceed with this and is a means of answering these questions.

It begins with the training community and the user community working together to establish the "what is" data base. Once the data base is established, then the planning can proceed. The inputs, processes and products, outputs and outcomes, once we have that established, then we ask, "Are there any differences that we want to accomplish? What are the change requirements in the outcomes position?" Once we know what outcomes we want, then we can proceed to determine the outputs, products, processes, and inputs. For example, the inputs might be, for a hypothetical problem, is that the hypothetical problem might be a NATO DRAGON gunner or poor marksman. We would document with the inputs, such as we would try and find the funding levels of the DRAGON training, the number of instructors used, and the number of ranges available. Under processes, we might want to know what are the number of practice rounds available. Under products, we would establish what the skills and knowledges and attitudes are being presently taught by the curriculum. Under outputs, we would establish that only 32 percent of the current graduates achieve first-round hits at stationary targets between 400 and 600 meters. Under outcomes, based on simulated practice it is felt that a NATO DRAGON gunner will be ineffective in actual combat. The outcome that we'd like to have would be 100 percent of the DRAGON gunners should be effective in the external world; the outputs that 100 percent of the graduates would achieve first-round hits on targets at 400 and 600 meters; and under products, the training community should develop training products that would be useful to DRAGON trainees as measured by the trainees' requisite skills, knowledges, and attitudes.

Now we'll try and address how this model will function in a military training community. There are probably two reasons we feel there is confusion in means versus ends. The first is there is an inadequate focus upon the outcomes of the training system and a focus on the efforts, the inputs, and the processes. We feel that the organizational elements model, by emphasizing the outcomes, will be more effective than if we focus on the inputs and the processes. The second reason we feel that there is a confusion between means versus ends is that there is a translation process of translating operational needs into training needs.

Training requirements originate from two sources: the parent Service, which is charged to provide mission proficiency standards and the unified commanders also specify training requirements for mission specifications and contingency plans; the second is how training requirements are specified. They are specified with the threat doctrine or structure deliberations. The point is that these two are external to the system. The organizational elements model may assist planners in dealing with these two characteristics because it emphasizes training external to the training system.

The third reason why military training requirements are difficult to deal with is that there is what we call a translation process. This translation process begins at the highest echelons with the threat doctrine or structure. It is translated into a second echelon into programmatic efforts, and then into a third echelon where the programs are further fractured into projects. The organizational elements model, we feel, has five elements which roughly correspond to the echelons with outcomes being specified in the one process, and products in echelon two, and then inputs down at echelon three. We feel that it would function to some extent in helping us through this problem.

In closing, we think the organizational elements model has potential in reducing the means-end confusion, and we hope that by its consideration, it may help you in some of your deliberations. Thank you.

Mr. Holt

Thank you, Dr. Beagles.

By way of closing, I would like to thank all our speakers for their fine presentations. They have raised our consciousness level to some very important problems inherent in the process of defining training requirements. They have also offered some very promising solutions. It's been a most gratifying and educational experience for all of us and I want to thank you gentlemen. Thank you.

SESSION IB

MANAGEMENT CONSIDERATIONS #1

Mr. Robert E. Coward

. . . . dealing with the theme of this conference. I would
like to make a couple of announcements first. Our way of doing
things here, the ones of us who have been around a long time
realize, is that the questions frequently are just as important
as the presentation. We would appreciate your support, your assis-
tance in utilizing the microphones to present your question. If,
in fact, we receive a question from the audience that isn't very
clear, we'll ask the speakers to repeat the question to be sure
they and the audience understood the question and try to work from
that sort of an MO.

We heard some very keen words this morning from the folks
starting off our session and I would like to relate to two of
them. In particular, Admiral Williams' comments and General
Tice's comments. Both of them dealt with some problems that face
folks like this group at the head table. The problem of jointly
working across the Services in order to understand lessons learned,
do cooperative work to common goals of research and development
and trainer delivery, and to try to wisely spend our national dol-
lars in preparation for training device delivery for our user.
In their comments in talking about this, they didn't really
directly refer to this group, but I think it's important for you
to understand the paper and the people who are presenting it.
This paper deals with the role of the joint logistics commanders,
the joint technical coordinating group on simulators and train-
ing devices.

The paper will be presented by Lieutenant Colonel George
Winters, who is the Chief of the Avionics and Training Systems
Division at Air Force Systems Command at Andrews. He is present-
ly the Chairman of the Coordinating Group. He was previously
assigned as a Program Manager for the Tactical Combat Trainer
Program known as Project 2360. He was at the Deputy for Simula-
tors or Simulator SPO, as most of us know it, at Wright Patterson.
Colonel Winters earned his B.A. in Metallurgical Engineering from
Cornell and his M.S. in Aerospace Engineering at the Air Force
Institute of Technology. His co-workers are Dr. Ron Hofer, who
is Chief of Operations Research and Engineering Management Divi-
sion, U.S. Army's Material Development and Readiness Command at
PM TRADE. He serves as the Chief Engineer for the Army Project
Manager for Training Devices. He was a past Chairman of this
Coordinating Group. He was previously assigned to Fort Monmouth
in Program Management and Laboratory Work. He earned his B.S.E.E.,
his M.S.E.E., and his Doctorate all at Purdue.

Jon Schreiber is Head of the Attack Training Branch in the Weapons Training Division of the Navy's Air Systems Command at Crystal City, Virginina. I think it is notable for us to understand that this gentleman recently received an honor from the Navy. He was awarded a fellowship as the Legislative Assistant to Senator Jeremiah Denton of Alabama. He earned his B.E. in Engineering at Youngstown State University, his M.A. in Engineering at George Washington University.

Williard D. Haugen, Chief of Systems Management Section, Training Devices Systems Management Division at Ogden, working in the . . . Branch there. He is working from the logistical support side, as most of these gentlemen are. I think that's important to bring out. He received his academic training at . . . State College.

I believe I've covered everyone. Gentlemen, are you ready to go?

Lieutenant Colonel George R. Winters, II

Thank you, Bob. One of the peculiarities of the group we're working with is -- and it's peculiar to the training world -- is the fact that many of the people in the training world don't work for the Joint Logistics Commanders, and that's represented by our fifth member up here, Ron McGee of the Naval Training Equipment Center, who belongs, by virtue of working there, to the Chief of Naval Education and Training, who, while he salutes smartly to Admiral Williams, does not, in fact, work for him directly. That's the purpose of his presence here.

Earlier today in the opening sessions, you heard many people challenge all of us to do things better and smarter. In fact, they asked us to innovate and we're going to get down to the nuts and bolts of that by the end of this presentation because we're going to ask each of you, personally and on behalf of your organizations, to take pencil and paper and do something. We're going to ask you to innovate and be creative. I thought perhaps I'd give you a little bit of a story to illustrate what exactly we mean when we talk about being creative and innovative in doing things differently than we have always done them.

The story is a sad one. It involves a recently bereaved widow who I guess had had some military experience in the family and recognized that you had to check up on everything that you had a vendor or a contractor do. She went down to the funeral parlor to check on the arrangements that had been made with her husband and she was generally pleased and the funeral director very solicitously asked if she was, in fact, pleased. She said, "Well, yes, everything is quite nice, but you've laid him out in a brown suit and I don't know about that. Brown wasn't his favorite color and it doesn't really go very well with his eyes

and it really doesn't even look like it fits him very well." He
of course recognized an ECP when he saw one and jumped on it with
both feet and said, "Well, we'll be happy to take care of that.
What color would you prefer if you had your choice?" She said,
"Well, I'd really prefer blue -- it goes better with his eyes and
it was his favorite color." He said, "Well, of course we can
take care of that. There'll be a slight additional charge be-
cause there are some expenses involved to us." She said, "Hang
the expense. Press on with it." And he did. And she came
back later and her husband was laid out in a nice blue suit that
went well with his eyes. It fit him quite well -- better, in
fact, than his suits had fit him for a while as a result of his
illness. So she sought out the funeral director because she
wanted to know just how badly she was going to be taken to the
cleaners and said, "You've done good work. I really like how
things have been arranged now and by the way, how much will it
cost me extra." The funeral director said, "Well, much to our
surprise, there'll be no additional charge. You see, shortly
after I got through talking to you I went down the hall and there
was a lady there whose husband had been laid out in a blue suit
and she wasn't terribly happy with that because her husband's
favorite color was brown, and so it was very, very simple. We
merely changed heads." We're going to ask you to change some
heads later on because you've heard, starting at the very high-
est reaches of the Administration working down through the four-
star level and the deputies and secretaries of Defense and . . .
now down through the Material Command Headquarters, there's a
recognition of two things. First of all, the training and train-
ing equipment are important and secondly, we've got to do our
jobs better.

If I could have somebody turn on the light bulb on the slides,
we'll get into the formal presentation of the paper, which is the
Role of the Joint Logistics Commanders Joint Technical Coordina-
ting Group on Simulators and Training Devices -- and if you can
say that all in one breath, you're in good shape.

That forces this audience in particular and for all audiences
to address several things, one of which is who or what are the
Joint Logistics Commanders, sometimes referred to as the JLC,
and then, having that behind us, to get on with what or who is
a Joint Technical Coordinating Group on Simulators and Training
Devices, otherwise known as the JTCGSTD and what do they do and
where do each of us individually and organizationally fit in.

Let's start with the issue of who or what are the Joint Logis-
tics Commanders. The next slide is meant to be impressive. An
awful lot of flags up there. That's our 19-star Board of Direc-
tors and I know people were talking this morning about the $25
billion annual budget and where they'd be in the Fortune 500 and
that kind of thing. Let me merely point out that over the life-
time of the budget year and the POM, the Program Objective

Memorandum, which runs five years, you are looking there at the
Board of Directors of a $1 trillion business entity. Now, that
number got the attention of people like Deputy Secretary of De-
fense Carlucci early on in this Administration and he started
meeting on a quarterly basis, along with many of his assistant
and deputy secretaries, with these gentlemen totally outside the
normal chain of command. That's Secretary Carlucci's prerogative.
It involves a problem for all the rest of us, including those
gentlemen, that we have to be very careful how we operate in that
environment because there are, between those of us sitting up
here and the Deputy Secretary of Defense in this environment
exactly three steps: our two-star level and those guys, and OSD.

Along with the rest of what are now called the Defense Acqui-
sition Improvement Program, which used to be called the Carlucci
Iniatives and which had another name before that, there has been
a re-emphasis of getting together on a joint basis, including
the Marine Corps -- General Hatch, who is the Deputy Chief of
Staff at Headquarters Marine Corps -- and doing things smartly
between and among the Services. We're seeing that in weapon
system programs, the new joint Army-Air Force Radar Program,
some Air Force-Navy engine initiatives, the H-60 Program, which
can impact all four Services -- the CH, SH, UH, and HH-60 Pro-
grams -- are being worked at major issue levels by these folks.
Now, obviously, they can't do it all themselves so what they
have done is each of them has a special staff member who is
designated as an Assistant or Special Assistant for Joint Ser-
vice Matters, and together they form what is called the Secre-
tariat of the Joint Logistics Commanders and they control the
agenda -- they're moat dragons. They control access to the
Commanders. Then they operate from there through panels, groups,
ad hoc groups, what have you. I won't bore you with the bureau-
cratic details of what the difference is between a Joint Logis-
tics Commander's panel and an ad hod group and a policy coordi-
nating group and a technical coordinating group, but what you're
dealing with here, a Joint Technical Coordinating Group on Simu-
lators and Training Devices, is a relatively long-lived one.
That is, we'll still be around at the end of this decade because
the issues that are involved in simulators and training devices
are not going to go away, as would be the case if you put a
group together to look at corrosion on F-15s, F-14s, and UH-60s.
That's a short-term kind of thing.

In any event, we're chartered to be around for a while. There
is somebody representing each of those guys up there. My boss
is on your far left, my far right.

I'm going to move off from the entity of the Joint Logistics
Commanders by merely pointing out that back in March and April
of 1982, Government Executive voted that issue to the Joint Logis-
tics Commanders. I'll move on then to specifically the Joint
Technical Coordinating Group on Simulators and Training Devices.

We have a charter which is reprinted in the paper. I won't read this, other than to emphasize a couple of phrases in it in terms of what the purpose is of that particular Joint Technical Coordinating Group. First of all, the matter of coordinating and consolidating -- in other words, do things smartly -- in cradle to grave research, development, acquisition, and operation and support of training devices. And then what I consider to be the key word, to implement plans to reduce the cost and/or increase the training effectiveness of simulators and training devices.

We've been told we'll do some things. What we do will result from a number of dialogues, of which this is one. This is not a debating society or a group that sits around and contemplates one another's navels. We've been told to come up with some measurable savings.

As I say, the rest of the charter is printed in the paper and you can read that some time when you're suffering from insomnia. But let me highlight a couple of things that are in it. First of all, we are to operate as if we were a staff agency of the Joint Logistics Commanders. There is no such purple-suited organization. We each have our own bosses who ultimately wind up in one of those four-stars. But collectively, we operate through that Joint Secretariat as if we were a staff agency of this fictitious Joint Logistic Commanders group, which has no real legal status but exists nonetheless. The second bullet is probably the most important. We're going to operate with finite tasks under the sponsorship of the Joint Commanders. One of the problems you run into with this kind of a group is that if we can't measure them we'll never get anywhere, because everybody has a particular ax to grind. We have our own peculiar problems in dealing with folks like the Chief of Naval Education and Training, in order to get formally down to the Naval Training Equipment Center, so without some way of figuring out how we're doing very specifically, you could bog down in pushing papers around. The method that has been chosen in this instance we will spend the bulk of the rest of the presentation on and that is to work finite tasks.

Another item to understand, we're going to work within the established planning, programming, and budgeting system. We don't have any blank check or separate kitty of funds. We've got to justify everything that we do and that was mentioned in the opening session this morning.

Finally, we do have a blank check in terms of talking with other folks, at least within the United States Government, ranging from the Department of Education to NASA to the FAA to the Inter-Service Training and Review organization, which is kind of a counterpart body made up of the Training Commanders, TRADOC from the Army, Air Training Command with the Air Force, Deputy Chief of Staff for Training in the Marine Corps (a luncheon speaker later in the week).

I mentioned that the tasks were the guts of the issue. There are certain ground rules for selecting them. They must be of high pay-off to two or more Services; if there are only high pay-offs to one Service, we work it without having to fire on our own position from this particular bureaucracy. Annually, we will select new starts and the new start selection cycle is such that we will be taking, in March of next year, to Redstone Arsenal what we have selected to pursue with our next batch, to be presented, hopefully, to those same 19-star folks. We will look at our old efforts to see whether they are worth continuing to support, and each one will have a designated lead command. In other words, we don't do things collegiately. We don't have any collegiate authority, but when I go home and put on my hat that says I am a member of the staff of the Commander of Air Force Systems Command, I can make things happen in Systems Command, so in some instances I'll be designated, or my Command will be designated, as the lead agency for a particular effort. In order to make sure that the other guys cooperate, they, in turn, will be designated for other tasks and require the cooperation of our folks on the ones that they're working.

There are several of these tasks illustrated in the paper and let me briefly touch on them. There is one which Air Force Systems Command is the lead on, via the SIMSPO at Wright-Patterson, dealing with the Defense Mapping Agency data base. Now, DMA deals with a lot of customers and their output is, as most of you are familiar, a digital data base. Not every customer has to do the things to that data base that we do in the training world and in particular, many of them don't have to enhance it. But among the Services and across the Services, what we have to do to that data base is fairly common. We'd like to standardize that, such that if the Navy develops an enhancement to the DMA data base, it's usable by the Army and the Air Force.

The second area we're looking at is electronic warfare threat data base standardization. I contend that somewhere out there in industry is the guy who moves from company to company writing the program for the SA-2 missile threat on every contract we award and they're all in different languages and different protocols. I think we need to stop that. We can model the SA-2 once and make it available to everybody; then if there's a change in the threat or enhancement to the threat, we can work it once and distribute to everybody worldwide and work more in near real time in responding to the threat.

Now, those two combined should give you a hint of the tip of the iceberg we're working toward. Sooner or later, we'd like a standard data base. That's mind boggling. There's going to be a lot of dollars of people who are sitting out hand modeling data bases at the moment that aren't going to have to hand model every data base on every separate contract anymore. That may be worrisome, but what I'm here to assure you is that if you didn't get the

flavor in the opening remarks today, we've all heard it in the Defense Science Board report and in our discussions with the Joint Commanders. As we get smarter and do better and improve our effectiveness, the size of the pot will expand and while you may displace some person out there who is modeling a Swiss alpine village, the business base will indeed expand as we show that we can do things smarter and deliver effective training devices.

Another task which is mentioned in the paper has to do with standard software management procedures on Defense Department contracts for training devices. We don't have to -- I'm tempted to say put up, but that's not the right word -- we're not required to do the same things that are required of folks who are working in the embedded computer world that goes on weapons systems, but that doesn't mean we should continue to do things dumb. I think particularly from the industry point of view, and even from the point of view of our software managers in our various project management shops, it would be nice to have one set of software management procedures that was applicable to every one of the contracts you had in plant or every one of the contracts that was being managed by your organization.

Now, some of that effort had gotten underway before we started to take it under our wing and I don't want to take anything away from those folks. They'll be presenting a paper in another session in the next two days. But what we're going to do in this mechanism, which is being led by PM TRADE, is get it blessed and make it effective because if those five guys look at it and say that's it -- we're going to do it, it tends to happen.

Then finally one that's not included in the paper. The Commanders, at the initiative of some other folks, directed that we look at training devices, both air crew and maintenance, for the H-60 programs -- CH, HH, SH, and UH -- and while retaining competition, make them as standard as possible.

Those are some ideas we had that the Commanders have already approved. The main point of this pitch and this panel is to energize all of you who collectively know infinitely more than we ever could to look at where we're doing things dumb or where you've got a Navy contract and an Army contract and they're done differently and that doesn't make any sense because it just runs up the overhead. We're looking for your ideas of things that meet those criteria of a pay-off and applicable to two or more Services. We'd like to take them under our wing, sponsor them, run them up to the Commanders, get them to adopt them as Joint Logistics Commanders sponsored tasks, and then do them.

Our next opening, our next window, so to speak, involves starts in Fiscal Year 1986, so we're not going to turn you on to do anything next week. If you do have ideas or some of the people in your organizations have ideas, we sure need to see them. In order

to spread the workload, as the JTCG does indeed consist of what you're looking at up here, we ask if you're Army, submit it to Dr. Hofer; Navy-Marines and that amorphous mass that's known as DOD -- OSD, DLA, DNA, DMA, whatever -- to Jon Schreiber; Air Force folks to Will Haugen at Ogden; and if you don't fall into any of these categories, to me. Now, this is on page 6 of the proceedings, volume 1, so only in the event you don't have pro- ceedings, you need to copy that down and believe me, we'll be more than happy to make that available later. The idea here throughout has been the organization does exist, it's got a fair amount of horsepower. We'd like your ideas, because together we can, in fact, do things smarter, train the troops better, and I am sincere when I say that I think the business base will expand when people realize that we're not dealing with gold plated toys.

Finally, there is a feeling -- it's a ground swell -- you heard some of it this morning. Training devices are indeed impor- tant. They contribute to readiness. They contributed in the Falklands, they contributed in the Middle East. There's also a feeling that Joint Logistics Commander sponsored tasks will pay off. We can't put that in dollars and cents quite yet, but indeed they will. And finally, we need your support in working the ones that are identified and we need your ideas to come up with some new ones.

That basically concludes the presentation of the paper. We'd like to move now into a panel because, as has been mentioned two or three times, we need a dialogue to get some of this going and what I'd like to do at this point is turn it over to Jon Schreiber. The Air Force has had its turn and we'll let the Navy chair the panel.

Mr. Jon A. Schreiber

Thank you, George. I appreciate those comments.

I'd like to start off by saying before we get into a little group discussion here, what I want to do when we get into it is to kind of have an open forum type discussion, where you can ask us questions and we'll try to respond to the best of our ability. If we can't, we'll put together responses and try to get back to you. The more questions you have for us, the better off and more functional this panel will be. If you don't ask questions, we're all going to have to get up here and tell jokes and tap dance, and none of us do that too well.

I started working in the training business myself back in 1969 with the Navy Department, and discovered back then that training wasn't really looked upon very favorably; it was kind of a second cousin, if you will. I felt back then -- and I don't feel that way now -- a Rodney Dangerfield-type complex -- I ain't got no respect. But I think we all have respect now and with

respect comes responsibility and a little bit of putting us all under the microscope. Our training budget in NAVAIR has increased tenfold since I started in 1969, and with those increased resources comes, as I said, responsibility. Unless we all do our job better and we coordinate what we do, those resources are going to drop and leave our area to go to another area. I think we all have a vested interest, both industry and the Government alike, to see that we take those resources and apply them to the areas that really need them.

I'd like to re-emphasize a few areas that were mentioned this morning. Admiral Williams made a point this morning that we have to improve readiness, and we have to improve readiness at the same time that the technological systems being employed in our weapons systems are increasing. Not only do we have to improve readiness, but we have to improve readiness in response to the technological advancements. And we have to do that with limited manpower pools. The availability of engineers, the availability of educated people in the Services is going to decrease as the century goes on. We have to take those things into consideration. We have to make more efficient use of our training and we have to apply our dollars prudently. As Admiral Williams said, we have to start exploiting computer technology, which I think we have been doing.

Something that General Tice picked up on which I was involved in this summer was the Defense Science Board study and their recommendations were very favorable in our area. They basically said we have to pump billions of more dollars into the training area because there are large pay-offs to be had there in training technology, improved training systems, and that type of thing. They also said that the Services are going to have to place more of a consolidated effort in this same area. We can't go at it operating independently -- Army, Air Force, Navy, or Marine Corps -- as different units, but we have to work together as one. They also made the recommendation that there be high level recognition at the OSD level.

I kind of think this Joint Logistics Commanders Group, although this was chartered back in the early part of last year, and that was in advance of the DSB study, I think this JLC Group does that for the Defense Science Board, as far as their recommendations are concerned. We are here to consolidate our efforts. We realize that the resources are, in fact, limited, and we have to spend them in the right area.

We also have not only our own Service interests at heart, but we have the industrial interests at heart. If we don't work it together, we're going to go nowhere.

When we made our introductions, I think we went down and I don't think you know who each of us are because we weren't sitting that way at the table. So let me re-introduce everybody.

Ron McGee is the alternate in our group from NTEC. Sitting next to Ron is Dr. Hofer from the Army and sitting next to Dr. Hofer is Wiliard Haugen from the Air Force Logistics Command at Ogden Air Force Base.

We want to do three things today in this panel discussion. We want to familiarize you all with what we do, which I think George has done adequately; we want to discuss the mechanics of how your ideas concerning improvements in training technology and reduction in costs can be used; and we also want to solicit and discuss possible new ideas. Now, we don't expect you to come up with ideas right now, but if any of you do have an idea, we'd be glad to hear it right now. Does anybody have any questions on how your ideas are going to be handled?

Question -- (Cannot be heard)

Mr. Schreiber

One of the things we are doing in that area -- I don't know how many of you are familiar with DMA and what their products are, but we're all looking at what we're calling a Level V Enhanced data base right now that's going to give us a digital data base we can use for not only our in-the-cockpit radar simulation, but also out-the-window visual tech system without having independent digital data base to give us the radar scene inside the cockpit and individual data base to give us an out-the-window . . . We're looking at a common data base that we could use to do both.

Question -- (Cannot be heard)

Lt. Col. Winters

I'll start with an anecdote. It was Admiral Williams who commented at our March meeting that he wished we all knew how much was enough and the rest of them nodded sagely. One of the things that has resulted from the Defense Science Board summer study is that those gentlemen have chartered their Directors and Laboratories, who believe it or not are known as the JDL or Joint Directors of Laboratories, much similar to us in terms of the reporting, to take a look at that arena. I'm about to pass the ball down the table because the Air Force representation is that of Air Force Human Resources Laboratory. The Army representation is that of Missile Command Engineering Simulation flavor, but Dr. Hofer is an associate member of that panel on behalf of DARCOM and I think he can probably give you more first hand information on what those folks are looking at to specifically address your question. Let me reassure you that it is a joint concern in a big way.

Dr. Ronald Hofer

The matter of training effectiveness has to involve somewhat the measure you're going to employ and eventually a decision on

how you know that you've achieved the results you set out to accomplish. The work that George was alluding to was a recommendation in what is known as the Herman Study that came out of OSD that said there needed to be a look given to . . . of the National Center of . . . for Training and Simulation. There has been this panel commissioned. My own outlook, I believe, is that the subject of training effectiveness, as far as what it means Servicewide, ... The problem I experience, I guess, in the day-to-day operation reaction to that is that many of the contacts that you work with aren't fully able to appreciate some of the dynamics that go into training and consequently, we deal with some sectors who think training is always . . ., has no cost associated with it, falls in between the cracks. I'm not quite sure that that can . . . very much longer because the costs that go along with training are very competitive now in the budget. So to address the subject . . . . the standard measure or standard approach for measuring training effectiveness . . ., I think it has to be trained in . . . ability to find and develop a total training system design . . . basically look at the status the same way we do weapons . . . the total cost to run and operate it.

Mr. Schreiber

I think we're all collectively trying to answer that question. Not only did the Defense Science Board Study recommendation say that there should be more of a concerted effort in training and training technology, and they made the recommendation that more resources should be pumped in that area, but they also said you've got to demonstrate the effectiveness of the application of those resources. Congress asks those same questions every year -- how do you justify those dollars; how is it improving training effectiveness. We're going to have to start doing a better job in that area.

Question

In the . . . programs, what errors were discovered and corrective action taken? It seems that this communications flow is somewhat restricted, understanding that it will take manpower to do this. But what is the Navy doing in their SIM program with the Air Force? Some type of newsletter, maybe, every other month or something -- it would be very subjective to measure this communication -- the type of acquisition strategy and something to help the Program Managers learn from each others' program.

Mr. Schreiber

We were hoping that this group would provide that function, that we would provide a lessons-learned type of thing between the four or five of us up here that we can prevent each other from making the same mistake. In fact, when I first got into this a

couple of years ago, one of the documents that was supposed to come out in conjunction with the Interservice/Industry Commerce was the same type of document you were referring to -- a lessons-learned type document. Now, whether we use this as a forum to do that or not is a question, but that is under consideration. This group will provide that service.

Lt. Col. Winters

If you look at the charter you'll find an interesting reference in it to the fact that it encourages, over those 16-star signatures, the use of this very Interservice/Industry Training Equipment Conference as a forum for swapping that information back and forth and our job, as a result, is to . . . people and tell them to show up and present a paper. Let me at the same time assure you that the Program Managers that you saw this morning, Colonel Campbell, Colonel Castellana, Captain McHugh, and Colonel Honeywill, meet and talk more regularly, probably, than they would really like to. I guess I am interested in your observation, as it is telling me something and we probably need to do a better job cross-pollinating. It sounded to me like you had in mind the acquirers and supporters, or are you speaking from a user point of view?

Comment

I'm Bob . . ., the SIMSPO HH-60, and I was speaking more down to the worker level, the actual Program Managers who set up the programs, set up the strategy. Some type of newsletter would inform what each program is working on between the Services, or the problems encountered, somewhere down to the worker level -- semi-annually or quarterly updated as an info sheet, points of contact. Most of the points of contact to the Program Managers has been through this Board or through the Interservice, but due to the space difference between the meetings, some type of more informal or a more worker-level information needs to be brought out.

Lt. Col. Winters

There was a thing, or I guess still is on paper, called the SIMTAG, or Simulator Technical Advisory Group and that was one of its objectives. We have a charter statement in there that says we shouldn't overlap them. I'm not sure how that will turn out, but as we develop specific projects, and I think the H-60 arena is a good one, we're going to force counterparts at the working level to sit down and talk and hopefully not get them involved in writing newsletters. We take the SH-60 ATD Program Manager and the UH-60 BLACKHAWK . . . Training Device Program Manager and the NIGHTHAWK -- as there you stand -- Program Manager and you view a sub-charter that says you guys will get together and talk about cross-servicing cross-support and taking advantage of the up front money that has already been spent. I guess I would say that we

are less than a year old now and come talk to us in about four years. I think we'll have a lot of people huddled together wondering what it is they're going to tell us for us to tell the Commanders. That's our intent.

Comment

I just want to point out that the exchange that we have had on this has been very beneficial to all parties, and we'd just like to see it be in the work-level program management to be pursued.

Lt. Col. Winters

We didn't plant him, folks. That's an unsolicited testimonial.

Mr. Schreiber

The H-60, the NIGHTHAWK, the BLACKHAWK, and the SEAHAWK, the . . . . issue did go down to the program management level. I know in the Navy it did, because I contacted the people who bought the simulators for the Navy. The Air Force and the Army did the same, so there was maximum coordination in that issue. We hope to handle the other major issues the same way.

Question -- (Cannot be heard)

Lt. Col. Winters

Again we have a problem of figuring out where we are with respect to the rest of the bureaucracy and there does exist this thing called the Interservice Training Review Organization. The TRADOC Commander is the Army member; the Air Force senior member is the Commander of Air Training Command. The schoolhouses, the schools that you're talking about, belong to those guys and we've got to tread very lightly. The interface we're working on, if you'll pardon the use of the term, is that there is within the Interservice Training Review Organization a technology/equipment/ whatever panel. We would like to work with them because basically, those are our counterparts, even though we recognize our output is the trained soldier-sailor-airman. As a trainee, he belongs to TRADOC and ATC. So we've got to work with our counterparts and eventually, I'd like to see those sub-panels of the Interservice Training Review Organization plus our sub-panels kind of go like this and then we're going up both chains and if it isn't obvious, I'll point out the obvious -- we've got 19 stars and they've got an equal or greater number and if we can get it together where all 38 or 40 of them are saying the same things, that's going to be a very fast moving freight train. So I appreciate your input, but again, we're treading lightly because if we start telling those guys how to do their business, they'll cut off our oxygen supply.

Question

Colonel, you mentioned the stars, and I had a question. The gentleman all the way to our left in your slide I assume was Coast Guard. Is that right?

Lt. Col. Winters

No. If my memory serves me, the way that worked and it was in order of seniority of those four stars, was General Marsh of Systems Command closest to the wall; Admiral Williams, who you saw this morning from NAVMAT; General Keith of the Army; General . . . . ., who is the Commander of Air Force Logistics Command; and Lieutenant General Hatch, who is the DCS, Installations and Logistics at Headquarters, Marine Corps. It is a DOD-only organization. Air Force somehow seems to get two representatives, but only one vote.

Mr. Schreiber

I think the bottom line, gang, is that if we're going to make this thing work we've got to do it together. So if you have any ideas, please get in touch with one of the five of us up here and we'll pursue it, and if it meets the criteria for a new initiative, . . . -- what we try to do is stay within a POM system, so if a new idea comes in now, we can possibly get it under the POM-85 budget; if not, we'll get it in the POM-86. The sooner we get those ideas in and are able to start going through them, the better off we'll all be.

Question

With regard to standardization, not re-inventing the wheel, modeling the SA-2 threat over and over and over again, we need to accomplish that, we have to standardize across all Services to make things . . . compatible, both software and hardware. What, if anything, is being done to define the interface between the hardware and/or software of training devices that we're all interested in?

Lt. Col. Winters

The session chairman is going to get the hook out in a minute, so let me quickly say that I think we're being driven in that direction by things like ADA. We're trying to push it in that direction with the software management scheme. Hopefully, we'll have some common architectures via the electronic warfare threat data base. Those are the first couple of projects in that arena and by the time we would then add, say, an IR data base or a radar data base or other electro-optical data bases, if we get all the pieces together, we will eventually achieve that standardization. I might point that that our philosophy of necessity has been the way to eat an elephant is one bite at a time and we're

trying not to get indigestion with the size of our bites, but yes, we recognize that and we're trying to move that way. Here he comes with the hook.

Mr. Coward

Thank you, gentlemen. I'd like to dismiss you and thank you very much. It is interesting, I think, for us to note that it took an awful lot of time to get black shoes and silver buckles on all the Services and to see a group like this working towards common efforts, I think, is really worthwhile and we thank you very much.

I'd like to get on with the introduction of the next speaker and keep us on time. Throughout this Conference there are several papers being presented dealing with a very important issue to all of us in this simulator-trainer development community. The problem of stating training requirements in a term or in a methodology that both the contractors, the engineers, the designers -- that all the folks involved can use in developing what the final design of the training equipment will be. Unfortunately, the way the papers went together, we didn't bring all of those sessions into one area, so I would like to get on with this paper called "Getting User Requirements Into the Development-to-Delivery Loop." I think that Mr. Frederic W. Snyder has some important things to say, so let me introduce Fred by saying that he is a Systems Engineer on the C-5, C-141 Air Refueling Part Task Trainer proposal and his prior background gives him a good look at this particular problem of training requirements. Fred received his Bachelors Degree in Psychology and his Masters Degree in Engineering Psychology from Wichita State.

Mr. Frederic W. Snyder

Thank you. We are focusing this week on the user. Now, if we were in another type of meeting, we'd have a meaning of user entirely different from what we mean here. I hasten to add -- users of training equipment, users of military training systems. We're talking about such things as have been mentioned earlier in the meeting. Admiral Williams talked about involving the user much more. I noticed, too, in the forward from the Conference Chairman -- look just inside the cover of your proceedings and you'll see this at the bottom. It says, "The voice of the user must be heard." You see, there is a problem and this problem can be looked upon as being a challenge, it can be looked upon as something to be brushed under the rug, or it can be something that we turn away from, that we don't want to discuss.

I might add that in industry, there is not just a homogeneous group. We have a mixture of people working together, particularly in an organization like a military training system, in that there are engineers and there are people with backgrounds in other

technologies and sciences. There are people there who have had a lot of experience with using training systems and other types of systems.

Personally, I've been out in the field enough to realize that there are problems and if, unofficially, the people at the very lowest level, if you give them the opportunity, will tell you a great deal about the problem. The problem is that some trainers fail to satisfy important user needs, despite the system that is intended to involve the user in establishing requirements.

So this afternoon, much more briefly than in the paper that you find in the proceedings, let's look together at some of the ways to shed light on this problem. Why is it that the lower echelon user is not getting a stronger voice? What modification of the input needs to be made in the communications process.

We end up concluding that there must be a way to find a better representation of the user point of view and it's essential to getting better trainers delivered to the field. Some approaches are offered to those who would look further into this, and I don't know how many of you here are already interested -- and I know some are -- and who are others who might get even more interested.

This important problem deserves our continuing attention until we get a better definition and come up with a working solution.

What we're looking at here is a cartoon which is intended to show you the problem. I think what I'll point out to you simply is here, that would be fine if the user happened to be an old miner in Colorado. But it turns out that this is what he wanted, just simply a wagon. A lot of things happen to requirements, and this, of course, is an exaggeration. It's partly due to the lack of communication that we get these kinds of results. It's partly due to the fact that there is a very complicated process in establishing requirements and in getting to industry with the specifications and getting industry to come up with the final results.

What if we have current trainer problems? We have some attack modes. First of all -- and this is always good news to industry -- buy new. You establish new requirements. You've outgrown the requirements. In fact, though, it may be that this trainer is a lot newer than we would like. We can go over to the right and we can modify. We can put out the ECPs just as long as there is money to cover the ECPs. Or we can take the middle ground and we can exploit current trainer potential. Now, this isn't always too popular in the industrial setting, but in fact, some companies do make a pretty good living making the best of a particular trainer, designing new systems, going in and helping to define a better way to use the system.

To get the user involved, we need to look at two aspects. On the left, the state-of-the-art trainer, the user knows a great deal about. It isn't too difficult to not only get involvement of the user, but it's easy to justify involving the user because he knows the most about the system. That's assuming that the user can be spared from his job, that there is a way for him to partici- pate. On the right we look at an advanced state-of-the-art trainer and most of those involved are saying that the user really doesn't know about this new system, so we really don't have to involve him as much as before. But I'm going to get to my next point, which is the thesis of the paper, and that is that we need to allow and to facilitate and to encourage user personnel to participate in all phases of any trainer development or acquisition. It may be more difficult when the trainer is brand new state-of-the-art, but there are ways of dealing with that problem.

I'll give you one example. If the user is not familiar with the system, we can always go to the user or have the user come to the proper location and he can be briefed with various types of devices -- sometimes models, sometimes even full-scale models and sometimes even with some computer aids -- to get that indivi- dual into the whole process of the thinking of this new system and then get their comments. The important point here is the user is a valuable resource and a decision-making person, and should have an important say at all times in the requirements analysis and in the development of the system.

It's a question of priority boiled down to we do what we want to do. If we plan for user involvement and it's more than just mere words and platitudes, then we need to budget the needed re- sources. And it does cost money to involve people, especially people who are engaged busily in training jobs and in managing training jobs. We have to commit the appropriate user personnel and we have to schedule some very definite events. For example, it may be that it's a panel that's required -- maybe several individuals who will have to stop doing whatever job they're doing and go, let's say, to a contractor's place and spend several weeks there providing information and input into a design. It does cost money. We have to have a commitment in order to do those things.

I'd like to define, for a moment, what we mean by requirement. On the left, we described the specialized meaning of requirement, which is what most people understand in the military and in govern- ment and industry, and that is that it's what we have authenti- cated. It's gone through a long process, some need, and it's based on what we decide is going to be that requirement that we will later discuss. The generic meaning is not based on anything other than the authority of what resides in the operational defini- tion. I suppose that the engineer and the scientist would be more excited about this definition of requirement. Well, of course, if

we do the specialized meaning properly, we'll have also accomplished the generic definition of the term.

. . . . the engineers at the contractor and the SIMSPO, and we have the user. All these folks need to work together in order to establish the requirement.

This one is maybe a little difficult. I don't know whether it's completely readable. But we start out with a communication of a requirement, usually with a need. We move into in-house review in the military -- usually we're talking about military requirements -- and we have the procurement agency, we have a justification of new system starts, we have the POM, we have the PMD, we release the RFP, and we have an area here where industry gets involved. Finally we have the contractor RFP response and selection, the production and deliveries, and then there is an evaluation, and then a period of time, usually, varying from one system to another, in which we finally restate the military need. The question is, first of all, this involves a great deal of communication. It involves a lot of possibility for the original stater of need to have lost the effectiveness of whatever that person said. One of the things that I would propose is that there be a way in which the user is continually able to place before everyone concerned the original statements of the need, before those statements of the need have been modified. It isn't that the need shouldn't be modified. There are a lot of factors involved in establishing a requirement, a proper requirement, but that original need that was stated should never be lost. It's like making a letter in which there are endorsements, and I propose that we consider that or something like that.

When we talk about breathing a life into a program, it has to have budget. It has to go through Congress and be approved as a budget line and it appears as an item in the Commerce Business Daily when the folks are involved in industry.

I guess the moral of this particular slide would be that you can't have too many spokes out of that wheel or it's not going to really stand up under the pressure. The hard reality of a solid requirement is that there are going to be users required; there are going to be research lab specialists involved, industry specialists, procurement specialists; the state-of-the-art is going to be involved; the cost; the schedule. From that, we can determine a solid requirement. But I would certainly emphasize that you can't have the spokes out on the user requirements and expect it to be a firm requirement, that when the trainer is delivered it's what is needed in the field.

Communication is a big part of the problem. Part of this problem is simply that we talk across similar lines. The generals talk with the vice presidents and vice versa; the majors tend to talk with the chief engineers across from agency to industry. In fact, that's exactly how it happens within many

organizations. Within industry we have that same situation. Now, there is value in that. When you look on the right, we get some messages going up and down which, in a lot of organizations, first of all probably wouldn't be allowed, but we find that as I have known the banner-carriers for requirements, oftentimes there is a major who is in contact with a general someplace. Yes, it's not official, but it's happening and it's something that certainly has worked, at least unofficially, and it probably is in your organization to some extent, and it needs to continue. Because the user needs to have lines of communication upward. He can very easily be left out.

Well, we have to keep the requirement and a lot of things happen. We have the basic technical requirement, we have priorities, we have the tight economy that we're faced with, and many other factors. So when we get through, we really can't always expect the requirement to be the same. I would like to point out, as we close in this message, that there are some avenues for improvement. One that I'm going to suggest to you is described a little more in the paper, but I'll just mention that when we work on the left, we simply are not communicating. The user is placing the order in the slot and he gets sent back to him whatever anyone inside thinks his request means. On the right is the open shop, and that allows the user in. He gets to communicate and talk and discuss, and when he leaves with his order it's a lot closer to what he thinks it ought to be.

We have the ISD process -- Instructional System Development. Most of you are familiar with this. It's an emphasis on getting primary data and an analytical process involving this data concerning the behavior and the tasks of the user, and it does involve, to some extent, user opinion. But I'm going to recommend that much stronger input be allowed of just pure user opinion. After all is said and done, a lot of things happen to the basic data. In fact, it's very difficult to collect meaningful behavioral data, including opinion data, and we need to keep trying, but I just simply want to emphasize that we need to keep the balance between the more so-called scientific approaches and the opinion approach, which has a great deal of value, especially if we're dealing with very well-trained individuals in their field in the training.

Avenues for improvement and in assuring fidelity and usability is first to recognize the communication limits, to schedule and budget tuning. What we mean here is that we can't always say in a requirement or in a specification what we intend. Communication just isn't that good. We may think it is, but if we recognize that it has its limits, then we will schedule sessions in which the user and maybe even the designer of the system will work together to try to tune the system to do what it's intended to do. Here, of course, we must involve user personnel.

Finally, simply, this is an appeal to deal with basic problems. These basic problems involve communication, which is a two-way process. It's not good enough in communication to say to the person who is communicating with you, "did you understand?" and they say, "yes." That's not good enough. You need checks to be sure that the individual understands and in the area of requirements and specification, it is critical.

We need to establish an approach. We need to define, we need to agree and establish an approach to solving this problem and, of course, we need first of all to recognize that there is a problem. We need to recognize the communication limits, to seek alternatives, and to provide feedback to the user. And that feedback to the user would be in the form of perhaps operating or maintenance manuals that would explain the developmental history and to guide and to expedite the full operational use of the system. The question that Admiral Williams raised was -- or perhaps the point that he made was that some things are worthy of pursuit and I would simply ask you the question, is getting user requirements into the development loop a worthy pursuit? Words are important and that's what we do so much of at these sessions. Action is really what counts.

Mr. Coward

Thank you very much, Fred. I appreciate that.

I would like to announce that the next paper had asked for more time to properly present the information that the authors feel you need. You notice that it's open-ended at the end of the presentation. Be advised that we probably will run over a little bit.

Probably to most of you our speaker does not need introduction. But I've got a charter and I think it would be appropriate for newcomers for you to understand that Dr. Jesse Orlansky and Dr. Joseph String, members of the Institute for Defense Analysis, and Captain Paul Chatelier, U. S. Navy, Military Assistant for Training and Personnel Systems Technology, Office of the Deputy Under Secretary of Defense, provided some very worthwhile information in the proceedings. It will be capsulized for you today as an update from last year's presentation and to give you some new information. Using resources of the Institute for Defense Analysis, they assembled important data that can be used by both the users, the acquisition managers, and also by manufacturers in the pursuit of effective training devices. Such data is important, I think, in the early definition, or as we are coming to call it, front end analysis, of training devices to adequately support arguments for funding and for resources needed to provide the training for our Services. Dr. Orlansky has assured me that you will not be able to easily search out the kind of information that he is going to provide to you today, and I think you will see that as you see his figures. I'd like to present to you Dr. Jesse Orlansky and his paper on "The Cost Effectiveness of Military Training."

Dr. Jesse Orlansky

I'm glad to have the applause at the beginning.

The material that I want to present to you has been collected over a period of years in response to a question from the Department of Defense that deals simply with how are we doing in the area of training, and I will try to show you how one deals with the questions, both of cost and of effectiveness, in some selected areas. If you were here at the morning session and some of the afternoon session, I think you will hear many of the senior personnel in Defense always cost effectiveness questions and I think they have a right to ask that question and whether or not they have a right to ask it, they ask it anyhow. Essentially what they want to know is not just whether the methods of training that we are proposing are any good. We tend to feel that that is the case for the items we push forward, but they always want to ask the second question, as well, and that is we know it costs money -- is it worth what it costs? I think that unless you provide that kind of information in all of your proposals, you're going to be behind the . . . That's the argument on which this paper is premised.

I mean to cover the following items and tell you just a little bit about how large the problem of training is at the present time, in numbers of people and in dollars. I want to very quickly summarize the data that have been collected in three areas that have been studied rather carefully, and then deal with the issue what does it mean and what do we have to do next. I'm quite prepared to deal with questions at any place where I go along, but for the sake of the audience, I think questions of clarification might come during the talk and then questions about discussion and debate might better come at the end. But I'll deal with them whenever you want to.

The first question -- how large is training? The data presented here comes from a report put out annually in the Department of Defense called "Military Manpower Training Report" for each year, and it essentially lays out the kinds of training that are given at different schools, numbers of people who go through those courses, and what it costs. That's what the data represent. I'm not going to read it for you in detail; you can find it in the paper, you can find it in the report itself whenever you want. I just want to show you what I think it means and how you might be able to use it. We have the various different types of training identified on the left -- recruit training, flight training, specialized skill training. The numbers of students who go through those courses are very large. They are the orders of hundreds of thousands and, in one particular area, 1.3 million students per year. That's a big deal. The costs are in the orders of hundreds of millions of dollars with a total of $12.8 billion per year for training. The cost per student is a number that I made up. I simply took the total

cost of dollars divided by student, and that's the cost per stu-
dent -- not the kind of number that the schools would use. They
use another factor, but the arithmetic is obvious. What that then
tells you -- and the length of the courses go from weeks to years,
four years for people at the Academy, a year for pilots, and so on.

What you take out of a table of this sort is the question,
where are most of the people trained? That's the 1.3 million
people in specialized skills training. That's where you could
have the largest impact in terms of numbers. Another question
might be, what is the most expensive type of training. That has
to do with pilots, which my arithmetic says is $100,000 per pilot --
it's actually bigger than that, but it's not less than that num-
ber -- and use that in any way you wish.

This is a summary from the same report of the amount of time
that we spend in military training. The first number is simply
the number of man-years of all those students shown in the pre-
vious slide. That turns out to be 255,000 man-years. There are
133,000 instructors who are assigned to those schools. You add
them up and you get a number a little under 400,000. You relate
that number of 400,000 to the actual end strength of the Depart-
ment of Defense, and it simply says that the Department of Defense
is entitled to have 2 million people per year. You relate one to
the other and you discover that 20 percent of the people that you
have are in schools all of the time doing nothing other than
getting smarter to do a job.

But before you get carried away and think that this is a very
big number, let me tell you something else. These just happen to
be the numbers on which I could put my hands. They are conveni-
ent numbers to deal with. It's the cost of running the schools,
where we know there are particular buildings and particular courses
at which people are being trained. So it's an available number.
But a person who gets out of a school -- this is all individual
training -- and then goes to an operational command really isn't
very able to do very much. He has to have on-the-job training,
he has to have unit and collective training, and that comes later.
If we're talking about pilots, this would have included the ini-
tial undergraduate pilot training; it would not have included
the kind of training a man needs to fly a military qualified air-
plane. All of that comes later. It is undoubtedly two or three
times anything that I've described for you, but I don't know what
it is and therefore it is not shown. So this is the absolute
minimum cost of training and it must be multiplied by some larger
factor, essentially operational and advanced training.

The cost of individual school training, as I told you before,
is $12.8 billion and this is simply a run-down of other costs
per year in other military accounts, and I think what you will
see -- and that's the only point I wish to make with that --
that training at the schools is a non-trivial amount. It is
quite competitive with other expenses that we have.

That says why training is important. There's a lot of it and it costs a lot. So let me then talk very briefly about what we know about the effectiveness and costs of training in three areas and the first is flight simulators.

Flight training is a large activity and we spend in the order of $300 million each year to procure new flight simulators and this also includes major modifications to the ones that we have, upgrading them. It costs us about $3.5 billion a year just to use aircraft, fly them around for purposes of training. That's only fuel, . . ., nothing else -- no salaries, no nothing. We train the order of 7,600 new pilots per year and at a cost of $1.8 billion. That's why flight training is an area of some interest.

I represent here for you current data on the costs of using either a flight simulator or an airplane. This is just the flying costs, variable operating costs, of aircraft or simulators and each of the dots represent a particular case where I have the data for an airplane and for the same simulator for that airplane, and I have 42 such cases over the last two fiscal years. This is current data. The median value of the ratio of the cost of the simulator compared to the cost of the aircraft is the red line and that's 8 percent. The values range roughly from about 5 percent to about 20 percent, depending upon the particular combination that we have, but the first thing that we would want to know about is what does it cost to use a flight simulator and what would it cost to use the same airplane, and the answer there is sort of the obvious one, but these are the data. It costs less and it is generally less than 10 percent. The same number was 12 percent about three or four years ago, so the trend towards the use of simulators on a cost basis only is more favorable to simulators. In other words, the cost of operating aircraft is going up higher, and it is now about 8 percent. But that only tells you what it costs to get into it and to sit there. It doesn't tell you whether sitting there is any good for you, so you must obviously deal next with the question of how much training do you get out of an airplane or out of a simulator. That's the issue I try to deal with here. In order to do that I need a certain kind of data called the "transfer effectiveness ratio," and I need three different numbers, which are identified here. You need to know first, for a particular task, such as making a landing, such as doing a loop, doing any task on which a pilot will be trained and graded, you want to know how long it takes him to achieve that standard of performance in an airplane and that is Item A. You then want to know how long it takes him to learn to do this same task in an airplane after having spent a certain amount of time in a simulator. And you also want to know the amount of time spent in the simulator. So essentially what the ratio permits you to do is to estimate the amount of flight time saved in the air as a function of the amount of time spent in the simulator. I'm going to use this ratio, now, in

a number of cases where I was able to collect the required data.
I have that data in 34 cases collected over a 10-year period, and
it runs from about -.4 in one bad case to almost 2.0 in a few
very nice cases, with a median ratio for all of those data points
of .5 -- .48 to be precise. What that says is that you save in
the air -- .5 -- one-half of the time that you spent in the simu-
lator. You save half the time. It cost you 10 percent. You know
instantly you're way, way ahead, and all of the cases that you
have on the right side of that median are better than the item I
just gave you of a median of .5. There are some cases where it
isn't that good, and in some of the areas, those data say essen-
tially the simulator is okay up here, but don't waste your time
trying to train with the simulator. In those cases, it is not
good enough. The airplane is just as good or better. But there
are very few cases of that, but I think to keep us honest it is
good to know that there's not only a general average, but that
this value is either high -- quite impressively high -- or dis-
gustingly low, depending upon what you want to do in the simula-
tor, and some uses of the simulator just shouldn't be done. The
whole picture is obviously very favorable.

Well, if you take those flight time savings and you translate
them into dollar savings in a few cases that have been done, you
can get savings per year for these three cases where the simula-
tor has been studied, including an airline. You compare the
amount of savings per year to what it costs to buy the simulators
in those particular cases, you divide one by the other, and you
find that you can amortize the cost of those simulators in two
years or less, and that's a very good investment. In fact, the
best of them all is in the case of the airline for a number of
obvious reasons -- airlines use them more carefully than the Ser-
vices do. The airlines run their simulators 20 hours a day; we
do not. So the airlines perform much better in their use of
simulators than the military.

Take computer based instruction. We know for flight simula-
tors, they are both effective and they save money. The answer
there is pretty clean. Computer based instruction would apply
generally to areas where we have large amounts of technical
training and I've listed for you that part of our individual
training where we have a large number of students. Most of them
turn out to be new accessions. Most of that training is on
account of the rotation of people into and out of the Services.
Three-quarters of them being trained now are the new accessions
at a cost of $2.8 billion per year. Computer based instruction
would be applicable to that kind of training.

I want to report the data that I was able to find as a com-
parison of three types of training. One would be conventional
classroom instruction that we're all acquainted with and there
the main key point is that the whole group goes at the same pace.
Then two versions of computer based instruction: one called CAI,
Computer Assisted Instruction, is the case where all of the

information is presented on the computer and that's what you tend
to see out in the halls here, CAI of one version or another. Both
the information, the answers, the handling of the student is all
handled with the computer. Computer managed instruction is some-
what different. The work here is done with a lesson book and study
carrels on laboratory benches, and the kids learn their lesson,
follow the book, and when they're all through they take a test and
write it down on a piece of paper. That piece of paper is then
given to a computer, the computer reads it and scales it and then
guides the student in the same way that would happen if it were
CAI. So I want to report results where these three different types
of instruction took place and where they could be compared.

You may not be able to read all of the legends, so I will tell
you roughly what you will see -- the critical part of it that you
have to look at are these little black dots. That's where all
the information is. But what you find here, each one of these
dots is a report of a study. What you find on the left are instruc-
tions that are given either by CAI or by CMI. This lists the par-
ticular type of system that was used in those studies, which Ser-
vice did it, where it was done, and over here on the right, the
type of training and subject matter for which those comparisons
were made. They include things like electronic, machinist,
recipe conversion, medical assistant, vehicle repair, and so on --
a very wide range of different courses. What we have here is a
body of data where we are going to compare student achievement
at the end of a course given over a wide variety of cases where
we will compare the student achievement with those who were taught
conventionally in a regular classroom group pace . . ., against
another group of students in the same course at about the same
time, taught either by CAI or CMI. That's what's up here. Now,
the data are given in three different columns. The student
achievement at the end of the course was the same -- the results
are shown here, each black dot being the report of one particular
study. If the kids who were trained with the CAI did not do as
well in their course grades as those who were trained convention-
ally, they would be called inferior and that would be shown here.
Or they might be better. I think it's obvious. You don't have
to be a statistician to say that student achievement in school
with either CAI or CMI gives you student test grades that are the
same or better than what you can achieve when you use convention
instruction.

Now, that's a very important thing to know because the general
argument is that computer based instruction isn't as good as con-
ventional instruction. The data are quite the opposite. The data
say that when measured at schools that student performance is
about the same or, if anything, it is better. Don't get carried
away, however, by the fact that it is better. The amounts by
which it is better -- and that's statistically correct -- are very
small and have no real significance, but I think the main issue
of is it as good can be answered it is good at schools. Now, I
must also tell you that's all that it says. It doesn't tell you

how good it is when the kids leave school and try to apply that knowledge on the job, and that's what counts. That's what we would like to know. That, most unfortunately, I have to tell you, is a good hunk of data that we do not have. But the methods of instruction are both equally good as we measure them at school.

The next question then is, and I think most people know this, does it save you anything. The main savings that you do find have to do with the fact that when students go through at a self-pace, their own pace, students are not held up by the average pace that you must set in a class. They finish at whatever pace they need and they leave, and in general you save time. That's the argument and this is the data. They are taken precisely from the very same study, so that the format of what I . . . tell you on the left and on the right is identical, except now the data are recorded in terms of the amount of time saved in the computer based instruction compared to conventional. Zero is here; that would mean that the amount of time was about the same. If there are any time savings, then we'd find a value in here -- 20, 40, or 60 percent time saved -- when they went through the course on a CBI basis as compared to conventional. You see that obviously most of the data, not all, but most of the data are on the time saved side. The median value is about 30 percent with these data. That's an impressive amount of student time savings. Some values are very high. There are a few cases where as much as 80 percent of the time is recorded as having been saved.

So we know two things -- that at school it is equally effective and that it saves student time. The next question is, how do the two compare. In this area, the data are relatively inadequate. The first two statements that I have made are, I think, quite substantiable. I think they are real, they're there. But the question of whether or not those student time savings really translate into true overall money savings has not been looked at well, except in a few cases which are reported here and they are not really current. They are studies done not more recently than about 1978. In general, computer based instruction reported in these cases turns out as not cost effective. Generally, these are cases where the . . . system has been used, then, and there were very large communication costs and where the student load tended to be small and didn't use up all of the capacity that you had. Under those conditions, it was not cost effective. The best set of data we have is from the Air Force at Lowrey, the Human Resources Laboratory, where they ran it on the AIS. You'll see an updated version of the AIS -- the advanced instructional system -- here at one of the exhibits. It was given a fairly good test over four different courses and the finding there is that it was cost effective in one course, not in others. The difference was very small. I think the only reasonable conclusion to make out of the data are two things. First, the fundamental thing that the cost data are strikingly inadequate and you really don't know what's going on, and to the extent a few examinations have been made, it turns out to be marginally cost effective, neither very

impressive on one side or the other. This clearly requires a much better look than has been given up to now and one that I don't think can be avoided any longer.

Maintenance simulators -- third area. Maintenance simulators is a case of where you have a simulator that duplicates some maintenance function and where the question to be dealt with is how well does a simulator train people in comparison to using the actual equipment. That's the issue to be dealt with here. The market for maintenance trainers is increasing. It seems to be largely in the area of aircraft, followed far behind by other areas of application. And now the sales seem to be about of the order of $100 million per year for maintenance training simulators. This is a study, now, similar to the one I've been telling you about before where I was able to get the data. Five different types of maintenance training simulators were evaluated in fourteen different courses that are listed here -- sonar maintenance, a particular radar, MOHAWK propellor system, and so on -- and the question again, as before, is how well do students do at the end of the course, whether they are trained either conventionally on actual equipment or on that particular maintenance simulator. The data are reported in the same way and in general they do just the same or better, in some cases but not all. Where time savings were measured, there was very definite time saving, but I have only three cases. Students tend to like it and instructors are sort of ambivalent -- some do and some don't. That's sort of a consistent pattern with all these new innovations.

I said that we have very little data to say whether or not a maintenance simulator would give us better performance and that's about the case here. Someone, who may or may not be in the audience, told me today about a particular simulator which I will not identify, but where they have preliminary data that says students who trained on that simulator now can do something of the order of 17 percent better performance in identifying malfunctions on actual equipment, compared to other groups of students who were trained only on the actual equipment. I would expect that this would be the case. Nobody has ever really looked at it; this is the first inkling that I have that this may actually be reported. The work is still going on and it's not yet published.

I deal here with the issue of how does the cost of simulators compare to that of actual equipment. Most of the maintenance simulators on which we have any data turn out to be prototypes. A few copies developed and they therefore contain very high R&D costs. It's a fair question to ask when you compare the cost of one to the other, should you or should you not include the R&D costs. But rather than fuss the issue, I made two different estimates. The estimate on the top is one where we compare the cost of the simulator to the aircraft, to the actual equipment, and where we include all the costs of the R&D pro-rated and include also the costs of building one unit. In that case, if you do it

that way, the estimate is the simulator costs 60 percent as much as the actual equipment. If, however, you do not include the cost of the R&D and just the recurring costs of building a new item, which is really what the cost of the actual equipment is, the value turns out to be 20 percent. So the true cost is somewhere between the two. My preference is for the lower value, but use any value you want. You clearly save money with maintenance simulators.

In one particular case, the Air Force maintenance station for the F-111, on which we have data, calculated the time savings as I did in the other cases and they compared the amount of cost savings that they got out of that to the cost of the simulator itself and there they were able to amortize the cost of that simulator in four years. Only one case, however.

This summarizes what I was telling you up to now. As far as measures of effectiveness go, all the comparisons tell us is that the performance with the simulator or with computer based instruction in the courses at school is about the same as what you get when you use either conventional instruction or actual -- depending upon the comparisons that we've been talking about. The effectiveness with these new devices is about the same that you can do in conventional instruction. You tend to save student time -- these are the values I gave you. The acquisition costs for the simulators are generally less. We don't know about computer based instruction and I see no point in acting as if we do. The operating costs tend to be less, depending on what we're talking about. You save on a life cycle basis and you can amortize them, in the cases given, within two to four years, which is a very good investment for military equipment. Those are the data.

. . . . know what we know, but the real question is are we home free, and we're clearly not.

Now I'd like to spend the rest of my time on this chart and the next chart, because I think that's the area where the pay dirt is. With regard to cost data, it's very clear that the cost data are quite inadequate. I've given you sort of a favorable impression by giving you the overall results and I've not bothered you with the messy details of trying to collect the data that I presented to you, and clearly, with the inadequacies in some areas where it just hasn't been done, that is just unacceptable. It's got to be done, particularly in the area of computer based instruction. We have no idea at all of what it costs to do the continuation training on the job after the kid leaves school. There's a very interesting possibility involved that computer based instruction and all the other data I was telling you about clearly saves money at the school, and I think that's the case without a doubt. But all it might have done would be to throw an additional burden on the job and we don't know anything about that. The true costs of training have to be the costs at school plus the costs on the job, and we have virtually zero

on-the-job cost training information. We may be kidding ourselves by making modest savings at the schools and simply throwing that burden or worse on the operational commands that are not quite able to deal with it. In order to answer the question, we need to have on-the-job data.

We have insufficient information about whether computer based instruction is harder for some students than conventional instruction would be. And data on attrition is an important ingredient in the cost factor, as well as on the effectiveness side. We might have to be running in more students if we lose them because computer based instruction is harder for them to handle. I do have some data that suggests that this might be true. I can show you, though I don't have the data here, that the attrition at some schools increased as computer based instruction was put in place, but the data are ambiguous. There are some problems with reading it, but the a priori basis is that you have every right to suspect that it is there and the question has to be addressed directly.

Other cost data have simply never been considered at all in any of these analyses, and that is the cost that we would have for the kinds of accidents, malfunctions that would arise because of inadequate training. We don't have the cost of on-the-job training involved, the ranges, targets, and ammunition. None of these have been factored into it. I suspect it would tend to favor the computer based instruction, but we do not have that information.

And finally, notice that all the data I was showing you has to do with the convenient type of individual training and that's a necessary beginning. Any military commander will tell you, as some have at this meeting already, that there are two crucial types of training that the data available to us do not consider. That is additional individual training on the job and all of the unit training to get effective groups and crews working together in the operational commands after they leave school. That's just a wide open blank that nobody has looked at.

The effectiveness data also needs some help. I'm not uncomfortable with what I've told you about it, but I think you also must recognize that there are limits to that data and one of the most significant is the issue of how long the information collected at the school stays in the student's head. That is to say, we have some notion of the learning but not a good picture of the learning curve at school. You must also have some knowledge about the forgetting curve of what happens to that knowledge after he leaves the school. It does you very little good to have a well-trained kid at school who forgets what he knows within a week. The idea of whether one method of instruction gives you better retention than another is a proper question to ask on which we have no data.

I've already pointed out to you that all of the information we have is success at school. I think it's a good idea to have schools but I really don't think we do our training just to have kids graduate from school. What you really want from your kids at school is to know how well they do on the job and the real criterion is not school grades at all, but on-the-job performance and that's been a very uninteresting question to our military folk. That school data are easy to collect; it just happens to be the wrong data. The right kind of data has to do with on-the-job data and they will have to simply get to that or they really won't know what they're directing their training for. They could be great at school -- useless on the job.

There is also the interesting possibility that has not been looked at that these methods of training, because of their flexibility, because they track students with each response, catch them when they are making their errors for the first time, are able in the case of maintenance simulators to train them to handle a very wide range of malfunctions that you could never handle with actual equipment -- really have the great possibility of doing much better. I have every reason to believe they could do much better than they are doing now, but there are practically no data to look at whether or not this is the case. The few cases that I've mentioned to you are just maybe suggestive and confirmatory that it's a good thing to look at. There has been a most interesting fact here that we have within our grasp -- the opportunity to do better training -- but nobody has really gone to the trouble to see if this is the case. I expect it will turn out to be that way, but it really hasn't been looked at.

And then what should be obvious at this point is that our training data deals only with individual training and every military commander will tell you he is mostly interested in his unit performance. He fights in units and he needs to have unit performance and we've not looked at that.

Because all of our data give us equal effectiveness, we tend to have differences due to cost savings and that's a good case. But we're not in a position yet to see what the relation is between increases in effectiveness and increases in cost to see whether there would be a proper trade-off. We really have not analytically reached the stage yet where we can do any more than talk about cost effectiveness trade-offs. We simply have point comparisons between one method of training and another. We could find a preference between the two, but we are not able yet, unless we get learning curve type of data, to do cost effectiveness trade-offs. That is to say, what is the value of additional training at school, what is the value of a more comprehensive, more exotic trainer which will cost more? Does it give you more improved training that would be worth its cost? We're not really able to deal with those questions. We don't have the data base.

I want very briefly, in concluding, to deal with a few points that do not come logically out of the information that I have presented to you, but which are consistent with it and which are really items that may be found in the report of the Summer Study of the Defense Science Board. There was such a large study this last year, the report has not yet been published. It dealt with training and training technology. But I think that some of the findings which it will probably make are consistent with some of the points that you can find in my data and I want to draw your attention to them.

The first issue deals with the fact that we have lots of new technology -- just walk through the stalls and it's obvious that we have lots of new things. Nothing new has to be invented. Just the head-on application and use of ways of training that we know exist on the shelf would help us a very large amount and much of our activity ought to be directed not just to doing it better but to simply using what we already know how to do and have not yet completely applied. The halls are an excellent example of currently available technology that all those companies would love to sell. It's not necessary to buy them all, but there are some very good items there. Nothing has to be done to them other than to buy them and to use them. The R&D has been paid for.

It is also pretty clear that the R&D folk have concentrated almost entirely on individual training. It just happens that the main military responsibility in training is unit training, as well as individual training, and this is the place where we have to have an increased activity.

The notion of performance measures is probably crucial. The question really always is how good is our training, and in order to know that, particularly on the job, you must have a way of measuring that. One of the steps that obviously must be taken would be to generate methods of performance that will tell us whether or not our training is adequate. With that, you are then in an excellent position to know what to do -- either to buy new equipment, to change your training program, and so on -- but without a training performance measure, you really are quite helpless.

There is also a need to collect and organize the information about training that are available in the different Services and to compile them in such a way that they can be used for new directions in training and probably even, I would imagine, take advantage of some of the information being generated by some of the other countries with whom we have close relations.

These recommendations would come pretty obviously from what I have had to say to you. But it is a matter of some interest that it also drew attention to some of the major studies of the Defense Department. That concludes what I want to say to you and I am prepared to take any questions you may have.

Question

Are the Services taking any steps to develop field performance data?

Dr. Orlansky

Some activities have just started within the last year. The major one is in a program by the Army mandated, interestingly enough, not by the training folk, I believe, but by the personnel folk. But it doesn't matter where it comes from. It is being done. It will probably be quite a while before we have that kind of data. The other Services are tagging along behind them. If they can say anything more favorable, I'll be pleased to hear it. So there is a very slow early step being taken which, in time, could provide us with some of the information. It is being collected primarily by individuals interested in personnel and manpower, but it would also be available for training and it would be useful for that purpose. But it does not exist yet.

Question -- (Cannot be heard)

Dr. Orlansky

Modestly, yes. Which is to say there are many system decisions made by methods that are magic, as far as I can make out, without such data. If you live with two or three aspects of highest priority rather than one -- maybe when I've finished with them I'll come back and order them for you. I think the major one by far is performance measurement because that will tell you where you are at and it will set aside the question of having to guess or wave your hand. I think performance measure is the driving factor. In other words, you've got to know what you're talking about and you've got to develop a means to figure that out. You wouldn't have a very good wind tunnel if you put an aircraft model in it and looked at it and said you like it that way but not that way. You've got to have numbers and we need them in training or in performance in the field as well as anywhere else, and there is no escaping it. So I think the driving one and the highest priority would probably be performance measure. The others, which will follow close behind that, would be data on both learning curves and forgetting curves, as the laboratory researcher would talk about it, but which, for those of you who are in management, the very same statement would really be what you want to know is the efficiencies with which training takes place in a situation where you can control them. That's the learning curve. You want to see at what rate does a person increase his knowledge in a school and at what place does it begin to flatten out, because when that is the case, the chances are that you'd better send him someplace else rather than spend lots of additional training time and cost for small increments in performance. That's the learning curve. The back side of it is how long does it stay

with you, because that's going to be the refresher training period. Undoubtedly, you're always forgetting in some way for different things, and what you want to know is how to optimize the refresher and on-the-job training so that you catch a person before he gets too far down and work at some intermediate platform. So learning and forgetting curves is the next thing. And then the last of three would be cost data. I happen to be quite ignorant about cost data, but I became interested in looking at it because I thought of it just as something an accountant in a green eyeshade would do, some idiot on a high bench someplace, and that it had no policy implication. Well, that's not the case at all. All the cost data have very important policy implications because it isn't so much the numbers that are at issue but the kinds of cost numbers that you want to include as relevant in the matter of training and the art of knowing what cost data are, how they ought to be collected and used, turns out to be a rather intriguing question. If you do it correctly, you would have the information to tell you what items in the training program are the ones that trouble you the most or out of which you can get the largest return. That would be the cost drivers. The other thing that you would want to know about are what are called by the people who know, cost estimating relationships. What characteristics in a training device, when you build it, are likely to be the best predictors of the total cost of that system when it gets out in the field. The reason to be interested in cost data is to be able to have more precise knowledge and control over what your ultimate costs are going to be in terms of some pieces of knowledge while the system has been under development. My priorities would be performance measurement, learning and forgetting curves, and cost data to be able to get cost estimating relationships and cost driver.

Question

Industry is looking at various approaches to training. Let's consider two situations and have you comment on that. One would be a situation where you have a three-dimensional hardware trainer -- you're going to teach a mechanic how to repair a piece of equipment -- so you duplicate the equipment physically in three dimensions in hardware form and simulate its operation electrically. That type of training can be also approached, again looking at cost effectiveness, by graphic representation of the same piece of equipment and I think it could be demonstrated that the graphic representation could be more cost effective because you're talking about a volatile presentation, something you could build rather quickly. But the final part of the equation is which is likely to be the more effective in actual use as the student then moves into the field and proceeds to maintain or work on the subject piece of equipment. I think a lot of us are very interested to see if there are any numbers starting to come out on that particular consideration. Do you have any thoughts on that?

Dr. Orlansky

No, I don't have any comment on that. If I understand the question, it was what is the on-the-job performance of people who are trained with simulators of different degrees of complexity. It's a perfectly fair question. That question has been looked at many years ago. The data are old and cold. They may or may not be relevant. It is a rather interesting thing you ought to be prepared to expect. I'm only stating this as a wild guess -- I don't have the data. Some old data say that for procedural training -- and some of this included maintenance training -- methods of training which were remarkably primitive, like just a drawing on a board, were just as effective as rather complex high fidelity trainers. It's an open question. I think you would have to look on it that way. I would hardly say that I could prove that, but I would not be surprised if it would turn out that way. I think that much of the differences in fidelity that we're looking at are probably not needed, but I would rather put that as a question to be dealt with on its face than say that you must have high fidelity. That's an open question, probably leading us in the wrong direction. Thank God, the more high fidelity you have are also more expensive, but people may start looking at it for the wrong reason.

Question

My question is relating to your comparison of the computer aided instructions to the conventional method, and why do you feel that there is a tremendous improvement, or at least some improvement, in going to the computer based instruction? Specifically, if the instructor had, say, visual aids or aids to assist him, would that make a difference? What level of audio-visuals or support did he have?

Dr. Orlansky

I obviously can't answer that question in the form it has been put, but I can tell you the kinds of answers that may be relevant, if you're interested in the answers. The field of psychology has been plagued by nobody knowing what they do and it's basic to find that when two different studies have been done, they differ with each other. If you have three, you get three different findings. That's sort of standard in the area of psychology. When you look at the data that I present for you, you have a remarkable fact -- there is no difference between the results. The results almost uniformly show you equal effectiveness. Uniformly. It is so remarkable a case that I sometimes feel there has to be something wrong about it. But the issue of uncertainty in data, that's not the problem. The real problem is what does it mean. It's quite clear that when you compared courses as given conventionally to the CBI one, the data show they are equally effective, maybe better, and you save on the time side. Now, what the instructors in the conventional course could have done, if they were

given a different course or a better course of different instruc-
tion, is a question which obviously was not addressed and I don't
want to answer questions that I don't have the data on. But I'm
willing to live with what I showed you and I think that is probably
the complete answer to your question, if you will accept that. It
is not an answer to your question as given. I don't know at all
if it would have been better if they got more resources.

Question

One of the reasons your results might be coming out the same,
is because of the equalization of some kind of an error term. I
would think if we're going to talk about cost effectiveness, we'd
need some kind of a standardized measure of effectiveness. We're
talking about effectiveness for what -- different kinds of things.
We've got a constant for cost. We know what that is, but we don't
have for effectiveness.

Dr. Orlansky

You would help me very much if you'd give me a hint of what
you mean by this unusual error term that we should be looking for.

Comment

I suggest, if we're talking about cost effectiveness, a ratio
of the two and we have the large error in effectiveness . . . .

Dr. Orlansky

I didn't give you any large error in effectiveness. I told you
they were all equally effective and that that was an astounding
fact. Why is there any reason to question that?

Comment

Equal for what? They're teaching different things, different
skills.

Dr. Orlansky

Maybe I forgot to tell you that whenever a kid takes a course,
he is graded on a test. The test is based upon an ISD process
which says he has to know those things before he is through in
the course. I suppose I forgot to tell you that the same test was
used in both cases and the performance was identical. Now, I don't
see why one has to worry about the fact if you find it. If you
think that it's not a nice finding, make up your own explanation.
It seems to me that we ought to go to where the problems really
are. The problems are not in the data. The data are probably
more than good enough. If you don't like the results, then I
can't help you. If you want me to think up a reason why it's . . .
that way, I can't think of a reason. I don't see any reason to

look for error terms. The kids were given the same test, the got the same scores or better. That's all you want to know. Now, there are a lot of things that it doesn't tell you, and if you want any hints I can help you a little bit, but it won't be on the effectiveness side. The hints have to do with whether, when they are measured on the job after leaving the school, it would be very important and interesting to know if, having passed the test equally well at school, they forgot more on the job than the kids trained conventionally. There are hints that that might be the case, but those hints are based purely on supervisory reports. It would be a fair thing to run job performance tests of kids trained either way in a blind way on the job so the supervisor didn't know how they were trained. That would be an important hunk of data. That would be quite helpful to have that.

Question

What might be the error term if you design a CAI system which is optimized to maximize the score that the student gets and the test that he takes at the end of the course? That CAI system may do equally well as an instructor, but the student will not pick up miscellaneous and extraneous information which, in fact, will make him a better ultimate performer on the job.

Dr. Orlansky

Could you say that some other way, sir, so I can understand what you're getting at?

Comment

Well, the ultimate proof of effectiveness is how well the student does once he gets out on the job.

Dr. Orlansky

There is no data for that, either for conventional instruction or for CBI instruction. I'm sorry about that. But there are no such data to defend conventional instruction.

Comment

What I'm trying to say is the current technique of measuring how effective you've taught the student is the measure of how well he does on the test?

Dr. Orlansky

That's the way we do it for all methods of training, regardless of what it is, and I'm telling you the data, using conventional measures, they are equal --- there are problems here, but we're not going to solve them by making up reasons that don't exist. It is not in the test scores. The test scores are methods

used for years now to measure performance of kids trained conventionally and the same instruments are used in all of the experiments that I'm telling you about. Given the best methods we know by which to measure, I think we have to live with the fact that according to the available data, they are equally well. I see no flaws of that sort in the data and I think the notion of trying to question that is probably -- be my guest -- guess as you wish, but I don't think that that's a pay-off area. I think we probably have to live with the fact that to the best of our knowledge with current methods of measurement, simulators, computer based instruction, train kids at school as well as other methods, maybe even better but I don't stress that, and they obviously save student time. I think that is highly demonstrable and we should be far beyond the point of worrying about whether or not that's true. If there's anybody who believes that that is not true, I invite them not to ask questions but to go out and run another experiment to get the different finding. That would be interesting to know.

Question -- (Cannot be heard)

Dr. Orlansky

That's a very good question; it's an obvious thing to do. There is one study now going on that will try to look at it, except for it and if it finds any good data, that has not been done. There is lots of nice data to say that the performance of maintenance personnel on the job now is strange -- they find large amounts of material they take out as defective which, when it goes to a base for a check, turns out to be good. False removals, and so on. There is a fair amount of maintenance-type data collected that could be used as measures of training that has not yet been applied. It's a very good idea.

Question

Based on some non-statistical findings in the Army, we have found that the only area in which we do any scientific acquisition of data happens to be in the most controlled conditions, which is in our institutional training, and I think that we can wind up making the wrong conclusions because that is so and I'll give you an example of what I'm talking about. We have reduced the training time in many of our courses and thus accelerate the better students. We have learned, though, that those better students, when they get out in units, are less effective than the guys trained in a longer period of time, which could equate to conventional, because the bright students tested out very quickly but they didn't remember anything in the units and we had to retrain them. Now, I say that we're not collecting enough data and never will with our current orientation on study effort in units, and we'll always be putting the emphasis on the data which we get institutionally because it's the only controlled condition we have. . . . . we need to do more acquisition of data in the area where we can, in fact, measure the performance.

Dr. Orlansky

I agree with that.

Mr. Coward

Thank you, Dr. Orlansky. I hate to cut this off, but the hotel does need this room for some other things.

There are two comments I would like to add. One is that I think it was worthwhile to extend the time to hear Dr. Orlansky's personal comments. I'd also like to say that your comments on savings using CBI and continuation training and OJT, I think, speaks very directly to the comments made by Admiral Williams, General Tice, and Mr. Blanchard about industry helping us target in on those sorts of training issues. I would like to comment about the error in the data. It is important to realize that in the CBI area, many of the devices are in a research and development mode and as such, were utilizing something of a very controlled environment as opposed to the typical school situation. Lowrey is a good example. So, as Dr. Orlansky said, we need to look more at this and get some verified data that we can really work with.

That concludes the Management Considerations for the afternoon today.

SESSION IIIA

U. S. ARMY USER PANEL

Brigadier General R. J. Sunell

I'm Bob Sunell from the Army Training Support Center. The Army Training Support Center, for you that don't know, is located at Fort Eustis, Virginia, about 10 miles from Williamsburg. The reason I always say that is because three years ago when I was told I was going to Fort Eustis, I asked, "Where is it; what does it do?" So we start out letting you know exactly where it is -- if you remember Williamsburg, you'll remember Fort Eustis.

Before I give my brief opening remarks this morning, I would like to introduce the members of the Army User Panel, plus one. First I would like to introduce Colonel Don Campbell, who most of you I'm sure know, PM TRADE. He's here to answer questions, dole out money, and that sort of thing. We have Colonel Bob Herrick from Forces Command, DCSOPS, and he will be giving a presentation this morning. Also, we have Lieutenant Colonel Creighton Abrams from DA DSCOP Training, who will also give us some words of wisdom, and we have Lieutenant Colonel John Beaver, who will be giving the Army Training Support Center presentation. Then we have plus one -- and that is Mr. Hopkins, who will discuss embedded training programs for us that he has been working on and that we felt was an important project. That will conclude our user panel and we will then answer any questions that you might have.

Today we will discuss many areas, involving substitution, miniaturization, and simulation. Requirements that we feel are absolutely essential for our future training programs. Our purpose is to discuss where we can save dollars in training and yet maintain proficiency and readiness on the part of our Force. And this is key to whatever we do.

This slide here kind of sums up our problem. As you take a look at the dollars on the left and you look at the years as we go out, the escalation and cost for just training ammunition alone. You see that it's caused by inflation and it's caused by increasing cost of the rounds that we shoot. For example, as you see the steep climb in 83, 84, and 85, the 120 round for the M-60 E-1 will run close to $2,000 a round. We plan to shoot 162 rounds on an annual basis for tank qualification. Every four rounds that we shoot is like throwing a new car down range, and so we have to come up with alternatives in substitution, miniaturization, in order to cut the cost in that ammunition. The same way that we can't afford to shoot TOWs, DRAGONs, and equipments like we have in the past, just because of those escalating costs.

Let me give you some examples of areas that we are working on at the Army Training Support Center. First of all, I apologize to any artillerymen in the crowd, but I'm going to use them as an example and it's not that it's artillery alone, but we spend

$23 million in TRADOC every year training forward observers by
shooting artillery. Now, there has to be a better way to do it
than shoot $23 million worth of artillery ammunition to train a
forward observer to adjust fire. So PM TRADE has bought from a
firm in England a trainer for artillery, observed fire trainer, and
we hope that will cut down considerably on our costs. But that is
one area that we really need to work on.

Another area that we are looking at is the use of computer and
computer games in training. We believe sincerely that this has
some really potential applications across all systems. Now, having
talked to the folks out at Atari some time ago, they told me -- and
I believe it -- that if they build a game that the human defeats
very easily, he never plays it again. The youngster never comes
back and plays it once he has defeated it. He doesn't put another
50¢ in. So what you do is make your games so that the machine is
a little bit better, increases in difficulty, and the soldier or
individual comes back and plays it over and over again and increases
his level of proficiency.

That's some of the things we're looking at in our work at the
Army Training Support Center, because as I look at the training de-
vices that we have now, we take the soldier up to a certain level
of proficiency, which is the minimum, and then we stop. We do
that repeatedly, but it's uninteresting and it's boring and we
could make him a lot better by using some of the features that we
find in our Atari games.

We are also looking at embedded training programs. That is
where we can do training by looking through our sights and getting
the picture that we are shooting at. Instead of shooting ammuni-
tion, we're shooting looking through inboard video. We're not
too far along in this, but there are folks that are working on
that throughout the country and we're very much interested in that.

Another thing is part task trainers. We just concluded an
operation at . . . where we said these are all the critical tasks
that a tanker must know in order to qualify or be proficient as a
gunner, loader, driver, or tank commander. We took all the trainers
that we had, listed the tasks, and said, "this is what this one
teaches." We took the crews through this and it was amazing how
many different part task trainers we had to go through to bring
the crews up to proficiency. But we did bring them up to profi-
ciency and so we're taking a look at all of our devices that we're
looking at now and we're saying, "these are the critical tasks that
we need to teach the soldier -- what does this train?" That's a
very simple question. For example, if you're looking at a unit con-
duct of fire trainer, you have to say, these are the critical tasks
for the gunner, the TC -- what does this train and what are we
buying? And if you do that and you tie your trainers to tasks,
then it's very easy to say, yes, we need that or no, we don't need
it. That's the way we're looking at it. Every trainer we're look-
ing at, we're putting a critical task list and asking what it

trains, what it teaches the soldier, and is it cost effective. I think that this is the way that we will continue to look at it in the future.

We also have some needs. We need to look and we need to start to substitute in a more accurate method, and what we have now is laser gunnery. We need to look at laser that we can shoot in our local training areas in Germany that will give us close replication to the actual round that we're firing. We're now using MILES that we own on our tanks and we're using it as a jerry-rigged laser gunner system. But we need to have something that's just a little more accurate and that we can actually train. Now, we did take some crews that had never fired before, put them through a laser gunnery program, and we were able to qualify them with their first round being fired on the qualifications range that they had ever fired. But it was a long, drawn-out drill. We need something that we can put in our home stations, in our National Guard Reserve organizations, Europe, and any place where we have to go somewhere else to shoot so we can maintain our proficiency.

We also have a desperate need to be able to have tactical engagement simulation with artillery. We haven't figured out a way to do that. We've asked industry to come up with something on this and we'd be more than happy to listen because we just are stumped in this, to be able to use our artillery in our tactical engagement systems.

We also would like to see a better way of mine simulation because, although we have MILES and we have really a tremendous training opportunity that we put our soldiers through at the National Training Center, we really lack the realism in mines and artillery and we have no way of playing the Air Force without saying bang, bang, you're dead because we have no way of getting tactical engagement simulation real-time kill data. We're putting it on our helicopters in the form of AEGIS and that will be coming out in 1984. We'll go earlier than that if we're finished with our tests, but we don't have the play of the Air Force in this and we would like to do that also.

The last thing is that I bring up as kind of the opener, we're working very hard in the area of robotics. We believe in training with robotics as a definite part to play. We're running some scale-down M-114s that we have put armor on and we're shooting at them with 50 caliber, which actually gives you the same trajectory that you would get HEP or HESH, and we find that an uncooperative target is quite a challenge to our gunners, rather than a target that's running on rails. We've discovered some tremendous things running this robot that we shoot at. We also have one that we have a human in, but it's much more expensive. So we're looking at that as a way of training using, again, substitutions -- substituting the 50 caliber for the main gun round, which is a much cheaper round.

Another thing that HEL is doing for us right now is that we're building -- we're just experimenting with it and we don't have any license on it -- a robotic ammunition reloader, where you take your 50 caliber brass and you dump it in one side of the hopper and it comes out the other in the form of ball ammunition or blanks. Here you save the transportation costs, all the things that are involved with ammunition and the reloading and reusing of ammunition. We don't know how this will come out, but it is something that we're interested in, the reloading of ammunition. Anyone who is a duck hunter or skeet shooter knows that you can't afford to buy your ammunition down at the local hardware store. You've got to reload it yourself.

The bottom line of what we're doing is simply that we ask the question, does it train and if it trains, what task does it train and we don't really want whistles and bells. What we want is something that trains a soldier in the task that we need to make him proficient in his job. We're perfectly willing to say that's good enough and accept a 90 percent solution.

With that, I'm going to turn it over to our next speaker, John Beaver.

Lieutenant Colonel John Beaver

Good morning. Before I begin, I want to discuss some of the state-of-the-art devices that we have in our inventory. It's essential that we understand that the systematic use and refinement of all training devices is driven by the Army's need to find better methods of substitution, simulation, and miniaturization. When I speak of substitution, I'm referring to such things as using a non-explosive training round without requiring permanently restricted ammunition training impact areas, thereby creating more land for maneuver. At this time, approximately 30 to 40 percent of our land use is being tied up in permanent impact areas.

The concept of miniaturization can effectively be demonstrated by using a tank firing rifle ammunition at scaled targets at a 400 meter range. Through miniaturization, instead of a 105 mm tank round costing several hundred dollars, as General Sunell pointed out, we can fire something at a cost of less than a dollar.

With respect to simulation, we feel that this area has the greatest potential for us. As an example, presently the United States Army is employing aircraft simulators to train aviators and it permits helicopter crews to fly at a minimum cost -- a lot less than it would if we were putting them in the real aircraft. In addition, computer supported tactical simulation systems permit Division Commanders to train their brigade and battalion level Commanders without ever leaving their garrison location. Eventually, the installation of such simulation centers at unit locations will make it easier and cheaper to train these battle staffs. The United

States Army's interest in simulation, substitution, and miniaturization is a positive attempt to counteract the restraints that we have against effective training.

The constraints on training are lack of time, land, high cost for service ammunition and fuel, lack of qualified trainers. Through effective training and the integration of modern technology, we can increase and maintain proficiency more readily.

Now I'll discuss some of the state-of-the-art devices that we have and are currently using. The first type of device I wish to discuss is referred to as a full task trainer. These devices are highly sophisticated in nature and enable the soldier to exercise a variety of tasks. It is critical to note that many of these tasks are essential not only for common day-to-day activities, but for survival on the battle field.

One of the most sophisticated training devices currently being developed is the conduct of fire trainer. The conduct of fire trainer is being developed for the M-1 tank, the M-2 and M-3 fighting vehicles. These trainers are designed to provide accurately detailed replication of the gunner and the commander stations on respective vehicles with all fire control and fighting equipments. They incorporate a visual system which displays realistic tactical target engagement scenarios. Their computer base capabilities provide for exercise of all gunner skills using the full solution tank control systems, and the direct fire and missile capabilities of the fighting vehicle system.

The UCOF constitutes a joint development effort with all of the COFs sharing common computer and other core components. To give you a better perspective of the internal components of the simulator, now displayed is the gunnery station of the M-1 conduct of fire trainer.

Another sophisticated full task trainer, which has already been mentioned, is the training . . . fire observation. This device is utilized in an institutional and a unit or sustainment setting. It is modular and can be placed in a classroom. It's an electro-mechanical device employing computer driven optics to simulate the delivery of artillery fire through a terrain scene that is projected on a screen. The TSFO consists of an operator station with a computer keyboard and information systems for the operator. In addition, the TSFO permits the simulation of one to eight howitzers firing from a single battery position, realistic times of flight for both low and high angles of fire and the added realism of time and point detonation munitions.

The field of aviation has for years been a source of the latest state-of-the-art advances in training devices and training technology. The synthetic flight training system consists of subsystems composed of student station and training modules,

instructor and device operator modules, cockpit motion platforms, and computing equipment. To discuss the entire system would deplete our allocated time; therefore, as an example, we'll discuss the APACHE combat mission simulator.

The AH-64 combat mission simulator consists of two cockpits representing the pilot and co-pilot gunner stations respectively, and is capable of simulating the sensor systems in a limited out of the window visual scene. The combat mission simulator will have roll, pitch, yawl, lateral and vertical, and longitudinal cue capability. At the soldier's station, the capability will exist to conduct separate training missions simultaneously or team training may be accomplished. The simulator will be controlled by a computer complex which will analyze the co-pilot or gunner inputs to the flight controls and then direct appropriate responses from the aircraft instruments, the motion system, and the visual system.

The next class of devices is defined as a medium cost noise and weapon systems characteristics producing devices. Here, a low altitude system called the STINGER will be used as our example. The system currently has two devices; the first is the STINGER tracking head trainer. It is a full-scale model of the STINGER weapon system simulating the physical characteristics, weight, center of gravity, and the hour detection capability. The tracking head trainer includes all necessary electrical components to provide the soldiers with the same indications as the weapon does in interrogating, acquiring, tracking, and firing at the target, except an actual launch of a missile. As you can see, the entire system is very transportable and will enhance its use in the unit, where it will be used for training soldiers. Once again, not only initial training, but sustainment training, also. This trainer is required to provide simulation in lieu of a tactical weapon that will overcome the training deficiency of having to expend tactical material to train STINGERs in the task that it is designed to support.

The second STINGER trainer is the STINGER launch simulator, or the STLS, which emulates the significant firing and eject characteristics of the STINGER weapon system. Experience with the RED EYE training program has shown that gunners exhibit very high levels of anxiety, fear for their own safety, and concerns about the weapon before their initial firing experience. Testing and surveys indicate a marked reduction in that anxiety and fear and an increase in confidence and gunner proficiency after participating in a live fire experience. The testing also shows that satisfactory results may be achieved using a training device which closely simulates the live round physical and psychological effects, including noise, blast, change in weight, and the center of gravity in the projectile launch. Additionally, a very significant increase in gunner proficiency was noted using the STINGER launch simulator and other types of these devices.

The application of training devices is not just restricted to the highly complex systems, but also applies to areas of basic soldier skills. In this respect, the subject of rifle marksmanship has been an area of key interest in device development. Here, the U.S. Army has instituted the utilization of a relatively low cost, yet highly effective diagnostic device. The example for this type of device is the WEAPONEER. Currently, rifle marksmanship instructors are limited to observe the firer's integrated act of shooting, either in a dry fire capacity or during live fire exercises. In either case, the instructor can only offer an educated guess as to how steadily the weapon was held on target and which error in steady hold is causing an unacceptable shot . . . on the target.

The diagnostic capability of WEAPONEER enables trainers to quantitatively observe and then correct the deficiency. This reduces both the time required to isolate a soldier's problem and negates some of the costs associated with firing live ammunition. Training is enhanced using WEAPONEER in that the diagnostic capability of the device allows quick identification of those soldiers with problems before they go on the firing line. You can send those soldiers that are going to make it to the firing line and work with the ones that are having difficulties on the WEAPONEER system.

The last area of device and simulation development I wish to address is that which the Army refers to as new advances and part task trainers. These are a series of projects which employ certain detailed technologies to enhance the maintenance of key certain skills. During my discussion of this area of effort, I shall use two examples to facilitate your understanding of our progress. The first example is the video disk gunnery system. This trainer is a real time device which is designed to teach and sustain realistic gunnery skills and effective engagement tasks. It is capable of presenting a wide range of engagement scenarios to a gunner, along with accurate visual, audible, and tactical cues normal to each exercise sequence from internal fire commands to cease fire. This device has the performance features of target scenes featuring moving targets, utilizing both main gun and coaxial machine gun . . . projections, target effects, firing blasts, and obscuration gunner controls, and a scoring and critique mechanism. The main components of this device are a gunner's console, a video displayer, and a microcomputer. The gunner console consists of a sight video display and controlling switches, ammunition selection, and a scoreboard display. The video displayer permits audio and video recordings and graphic data. The microcomputer transacts all tracking, ballistics, performance evaluation, and sequencing. There are three versions of this device under development for the M-60 series tank, for the Bradley fighting vehicle, and for the combat engineer vehicle.

The second example is the introduction of the video arcade technologies. This area has received high visibility because the

80s represented the Army with new and unique training challenges. This period will see the Army in transition with the introduction of many major new weapon systems that represent vastly increased combat capabilities and the reorganization and tailoring of the Army's combat division to better defend American global interests. However, the same period promises to be one of the most constrained on resources. It seems only practical to take advantage of all opportunities that appear potential to improve combat skills. The technology found in video arcade games may provide some of the opportunities to hone combat skills in non-traditional Army ways at a very low cost.

Finally, a training program that is often forgotten is the large volume of training publications and maintenance publications. Our goal is to develop a general purpose information delivery system that is efficient and cost effective. Shown here is an electronic information delivery system using video disk technology, which will be used to deliver a total job package for both primary and refresher training. We anticipate the soldier can interact with the device by touching the front of the screen or talking to the machine, and can initiate a particular training or maintenance activity. We are able to get motion; for example, you can connect a cable from one connector to another connector and get immediate feedback when the soldier performs improperly.

To make the point of my remarks, here is an example of what can be accomplished using an effective training program along with the proper mix of training devices. Essentially, our DRAGON anti-tank gunners were capable of hitting a moving target only 57 percent of the time. Through better use of the launch effects trainer and the introduction of the launch environment simulator, which gave the psychological aspects to the soldier, which replicates the blast and the weight shift as the missile leaves the tube, the gunner proficiency was raised to 95 percent hit probability against moving targets. This was an important improvement in combat readiness.

The examples I have discussed have been but a few real world applications which permitted you to glimpse the U.S. Army's near-term solution to its training problem. With respect to seeking long-term solutions and identifying training needs as soon as feasibly possible, we have integrated two major efforts to grapple with the needs of the training community. The first is the weapons crew study, which seeks to optimize the resources available to training by meshing dry fire, live fire, and the use of simulators in a proper mix to enhance the proficiency of the individual, crew, and the combined arms activities. This study will delve into all the major weapons systems present in the Army following our conceptual assessments of the trade-off between proficiency and resources. As you can see, we hope to reach a higher level of proficiency with less cost, using substitution, miniaturization, and simulation.

The final objective of the weapons crew study will be to analyze the current training program and recommend solutions which can eliminate the training gap. The training gap on this particular slide is that white area that surrounds the live fire low caliber that you see as the peak on the chart.

The implementation of some future system training plan -- the importance of this future plan is that it will analytically demonstrate the best methodology to apply at the different levels of training and would hopefully result in this.

The second major effort which I alluded to is the Army Training 1990s Command Performance Review, which has gone forward and is now part of the Army's plan. This document imparts the across-the-board status of efforts which will lead to the full implementation of programs and strategies best suited to support the Army's training goals. The Army Training 1990s Program analyzes the triad of training -- the institution, the unit, and the training support. Common to all of these integral parts is the requirement to tailor any solutions to encompass a close examination of military occupational specialties, the type of training product to be utilized, and the system that is the vehicle of the change. The baseline of viewing changes from this perspective of MOS product and system is the foundation of the Army 1990s philosophy.

There are other significant actions being initiated in the U.S. Army to address substitution, simulation, and miniaturization. As an example, the standards in training commission are . . ., which is the Department of the Army level agency chartered to establish procedures to maximize individual and collective skills and serve management and execution, and develop standards for a physically and psychologically tough force. This commission presently is chaired by Lieutenant General Becton, which clearly emphasizes the criticality of its mission.

The message is that the U.S. Army is actively seeking a better way to utilize devices and simulators, coupled with an increased emphasis on the management of these instruments. The views of the field commanders, as well as those of the staff, are even now being meshed into a realistic, viable, and cohesive training strategy for combating the perceived future shortages of resources.

In closing, our current efforts are not perfect and we fully realize we have not explored all of the possibilities. Some of our systems for substitution and miniaturization do not train as well as we would like. Additionally, although we are integrating modern technology into simulation, there are certainly other alternatives left to explore. The crux of our efforts is to perfect and field cost effective devices and simulators to enhance the training of our target audience -- the soldier.

I'll be followed by Colonel Bob Herrick, of Forces Command.

Colonel Robert Herrick

I'm very pleased to be here at this conference and represent FORSCOM. Major General Doyle, who spoke last year, was the DCSOPS FORSCOM, and General Leland, Director of Training at FORSCOM, are unable to be here because of a conflict with the FORSCOM Commanders Conference ongoing.

Along with the Army's deployed forces in Europe and the Pacific, FORSCOM is one of the major users in the field that considerable attention is being given to at this conference and we appreciate that. FORSCOM not only includes the majority of active Army units, but also includes the U.S. Army Reserve and is responsible for training assistance and evaluation of the Army National Guard. FORSCOM's mission is to prepare Army forces for mobilization, deployment, and commitment to combat if required. Obviously, the mission is big and the job is very difficult to do.

Keeping my remarks brief, I would like to provide just a few thoughts on why the job is so difficult and why FORSCOM needs the help that technology can provide.

Our active units, brigade and below, are organized leanly for combat operations. In other words, they are organized as if they are already trained for combat and are in a combat environment. They are not organized to conduct training nor are they organized for garrison operations. This means that missions are imposed upon the combat organization, namely garrison missions and training for both garrison and combat operations. The organizational and mission situation in FORSCOM is a reality that we cannot and will not escape. Nor can we escape other realities. Our units are and will continue to be under strength in leaders; we will continue to suffer severe turbulence because of overseas replacement requirements. Also, we cannot escape the reality of training resource constraints, especially in the ammunition area.

Our Reserve components suffer similarly with the added constraint of very limited time. There is really only one solution to this dilemma. We have tried many. Some we have tried is to manage better, VTMS, other efforts to train our leaders better so they could train their subordinates better -- many efforts over many years. There is only one solution. We must become more efficient in the performance of all our missions. Training for combat and garrison missions and garrison operations. We must make an almost impossible job do-able and achieve higher standards than we have in the past. If technology can make the job of trainers and units significantly easier, if technology can streamline garrison operations and thus reduce its burden, and if technology can enhance the training of soldiers and units for combat, the user FORSCOM wants it and needs it badly. The user does not seek technology that increases the burdens we already have. Message from the field. I will be followed by Lieutenant Colonel Abrams from DA DSCOPS.

Lieutenant Colonel Creighton Abrams

(Due to technical difficulties, parts of Colonel Abrams' remarks were not recorded.)

. . .What everybody on the Army Staff does, essentially, is fight for resources. It is fighting what the newspapers tell you about the incredibly escalating budget for Defense. If you're going to get more for whatever it is you want to do, somebody else is going to get less. It's a very competitive arena.

Now, we take a very hard look at how good that solution of substitution, miniaturization, and simulation is. We do not want to retrace the problem of the growing costs of . . ., fuel, and repair parts with another problem called the growing costs of devices, simulators, and simulation. We must be able to show that we're getting something for the investment.

What I'd like to talk about briefly today is a kind of particular problem somewhat referred to by Colonel Herrick that some of you may not be aware of. Several years ago, General Gorman made a talk to a similar group of people and talked about institutional versus unit training. Institutional training is what we do in the schools. It is characterized primarily by efficiency, and so naturally enough, the schools . . . . under users of training devices and simulators because it makes them more efficient. WEAPONEER, one of the things you just saw there, is a great example of that. It's used by the Army Training Center.

But the guys who are maybe more important are people in the units, because although a lot of learning takes place in the institutions, the soldiers spend 80 percent of their time in the units. That's where most of the training, in fact, takes place.

Where they use some of that training -- a lot of it, for example, are places like Korea and Europe. Now, the implications of Korea and Europe are they're going to go to a come-as-you-are war. No extra time for training once the balloon goes up. The same thing applies to units in the Continental United States. Many FORSCOM units will come-as-you-are in a war. No additional time for training. Most units -- it's no secret -- like to peak during the year. One of the peaks that we have is the National Training Center. If you haven't been there and you're in the training device/simulator business, it would be well worth your while to go see how units train at the National Training Center at Fort Ord, California.

People also peak at other times of the year for big events like . . . crew qualification. Units have to maintain a certain degree of . . . maybe not as high as that peak that they were using throughout the year. That's really where . . . the simulators and devices come in, although as I'll mention later,

there are . . . when we go into the simulator. What we want to do
is cut down on the decay, the . . . , the valleys after those
peaks. Going back to Colonel Herrick's remark about the problem
of lots of things to do to the unit, there never seems to be
enough time to do them.

. . . . . that, of course, . . . into all those other neat
things. If you're in the Army, you know what they are and what
they aren't; if you're not in the Army, Marine Corps, Air Force,
Navy, believe me, there are lots of other things going on out
there besides training. . . . . there is something called a
hostile training device.

Finally, you need to understand that soldiers fully capable of
breaking . . . ., imagine what they could do with some of the fancier
kinds of training devices we would like to get out there in the
field for them to use. What does that mean?

I'll give you a couple of insights into what I think unit
devices and simulators should be like. The first thing that's
important is some simulators can actually be used for qualifica-
tion. The STINGER, for example, is cost prohibitive for annual
qualification of STINGER air defense coverage. Hence, STINGER
coverage qualifies a moving target . . . They don't qualify live
fire. The list of other weapons systems on which we will qualify
gunners is going to grow. We can't afford to qualify every gunner
. . . . live fire. But that is not the raison d'etre. For de-
vices and simulators, ... of those critical skills through-
out the year. The big difference.

Let's think about unit devices -- and this is probably true
of institutional devices -- they must pass the credibility test.
With everyone -- . . . with the guy who got it originally and
he loved it and he convinced all his troops that they loved it --
a good device must pass the credibility test in an . . . environ-
ment. Sometimes that is very difficult. This does not mean,
however, that it must precisely and perfectly pass the "realism"
test. And I'll talk a little bit more about that.

Reserve component -- the Army has 24 Divisions; 8 of them are
in the National Guard; all of them are in the Continental United
States. There's a whole bunch of other Reserve components out
there. They are a big part of the Army. In fact, we don't think
we're going to war without the Reserve component -- any war --
little war -- big war -- they're coming. So they're important.
Some of them are going the same time as the Active component. Some
of them are going to a come-as-you-are war. Now, you all know
Reserve components have 38-day . . . and they don't spend that
entire 38 days a year training. They're just like the Active com-
ponent. Now, you talk about people who need devices and simula-
tors, it's the Reserve component. But, a big problem -- they're
not centralized like the Active component. They're spread out

all over the place. And they might do their training on weekends,
except for the 15 days a year that they go for annual training.
So that's a tough training problem for devices and simulators.
Devices and simulators tend, sometimes, to be a little bit on the
expensive side. I'm not exactly sure we can afford to send the
. . . devices out there to all the Reserve component units. So
we're trying to find something . . . . . it may not be as good
as the best you can get, but we can proliferate it a lot better.
Or, maybe we'll try to take some of those expensive ones that
really do a great job and make them mobile so they can move them
around from place to place and be used.

Last slide -- I've talked a little bit about unit devices, but
this next group of . . . here is about . . . . . . It's very
difficult for us to field a device that supports a new weapon sys-
tem coming on-line because we say we've got to . . . the design
of the weapon system before we can start to work on the device.
Some of that is true; however, I think it is also true today that
we have been too often too concerned with perfectly replicating
the machine on which the soldier . . . Focus on the human skill
.. . first and you may find some better solutions than perfect
replication of the things they want to operate or shoot, drive or
fight. Focus on the critical skills of this tough environment
out here trying to convince people we need this device or that
device. A device that addresses a peripheral skill, it's a little
bit hard to convince people we need. . . . . .

Here's a new one -- at least, I think it's new. Measure the
skills . . . We've got to come up with a little bit better ap-
proach on showing people what we're getting for the device. One
of the things that's missing is showing what skill that trains
for. For example, . . . integrated laser engagement system --
one of the questions we're asking is should we be doing a platoon
task . . . so that we could do a little before and after number.
Before they did the final screening, they put two . . . .
After the final screening, they were good.

We believe that conservative resources, one of the goodies
that devices provide you, in the case of flight simulators and
MILES, we think that the resources being saved is people. That
is, there are some things you can practice on a flight simulator
that are just hazardous to your health to practice in a real live
airplane. And in the case of MILES, we think soldiers learn les-
sons in a training environment that they used to learn on the
first day of war. We also can save time and ammunition and
bullets and so on.

I'm sure everybody here already believes in devices and simu-
lators. You're all saying, "But we're already doing that."
That's the whole point. Then the next point is, we want that
device to be a better mousetrap. I hope that it's competitive
for you guys, too. We want to pick and choose. We don't want to

replace the high cost of all those other . . . resources with the high cost of training devices. We want to see a better mousetrap. That also means one that's obtainable, economical.

I had to throw this slide in here. It just means I'm a chauvinist, I guess. There are two reasons why I put that in here. The first reason is that we've all got to appreciate the economy to know that prejudice -- and I don't control this process somebody else controls it -- on what kind of things we're going to buy and so on, obviously the prejudice is going to be in favor of things that are American. That's a word to the wise. But the other thing is . . . . American technology, computer technology, as I understand it, is pretty darn good. That's where a lot of the good solutions are going to come from.

. . . . They're doing that right now. They're stretching technology to find technological solutions.

That's all I've got. I would like to say that after a year plus of working in this kind of a business, it has been a real delight to work with General Sunell and Colonel Campbell. . . . . and I just want to thank you both very much.

I'll be followed by Dick Hopkins.

Lieutenant Colonel R. K. Hopkins (Ret.)

It's a pleasure for "Plus One" to be here today. General Sunell called me a couple of weeks ago and asked if I would agree to serve on the panel because of my association with General Electric Company in development of the UCOF. I think the purpose of this presentation or what he asked me to present is to provide for you a sample, I think, of what one company has done to attempt to meet one of the user training requirements, which is the training of the gunner and the commander on major tank systems.

What I intend to do is briefly review for those that are not familiar with the UCOF, the characteristics and capabilities, and then I will go into a discussion of what General Sunell has described as the embedded training that is in the UCOF which we define as the instructional subsystem.

The production of a complete trainer is a new endeavor for General Electric. In the past, they have developed and produced visual systems; they've developed and produced a combination of visual systems and hardware. But in this instance, they have developed and are going to produce a combination of a visual system, the hardware, and an instructional subsystem, whereas in the past the recipient of the component actually developed how it would be used and the training that would be associated with it.

It appears that the projector isn't working, so while it's being worked on, I'll be glad to take questions.

Question -- (Cannot be understood)

BGEN Sunell

Unfortunately, I guess we did lean on the individual side pretty heavily today, because that's what we are involved with, as you know, in fighting for dollars and for assets. MACE is one that certainly is a battalion staff trainer that has been developed by Leavenworth, and it's out in the High Technology Division at Fort Lewis and also it is being put into Europe on a Test Best basis. We have the CATS, and certainly we do use and are working on unit trainers, and certainly MILES, in the National Training Center, is completely devoted to unit training. I apologize for not getting more into that with this Committee. We also are working on . . . which is another unit-type staff trainer.

Lt. Col. Abrams

I'd like to make a comment representing the real user, more or less. We are doing a lot of things, we have done a lot of things. Where our real problem is is not really at the battalion level. We've been attacking that, we're doing pretty well at that. It's not really totally at the individual level. It's at that Company level and below, and the capability of those units -- the NCOs, platoon sergeants, squad leaders -- at that level do that very, very tough, multiple job of bringing their soldiers up to the standards we all want. Now, that's unit training at squad, platoon, and company level. All the things that we do at battalion are needed. The whole spectrum is needed. But where it falls apart is at that level, and that's the level where people get killed in combat, and that's the level where the proficiency means victory or defeat. That's where I think we need to really look at how to help that first and second echelon trainer do his job.

Comment

I'm Bill Krakoff from DARCOM Headquarters. When you're spending a half billion dollars to a billion dollars on the conduct of fire trainer, the cost of doing what you're suggesting is absolutely nothing. Anybody can see that it transfers something. Is it worth a billion dollars to transfer that thing? That's what the issue is, that's what you have to show. And the cost of playing around and showing it is nothing. The thing is going to be in the system for 20 years. You're going to train thousands of people. That cost is nothing. And when you do show it, you get proponents instead of people fighting you. The other thing is, you have to also show that the next year, you're not going to have more ammunition than the year before, plus the trainer. They want to hear that you're going to have less ammunition next year, not more. The Army has always said, "well, we only did 27 percent of

our thing -- now that we have the trainer, we're going to do 29
percent." When that happens, when we get that whole exercise
in hand, then I think training devices are going to blossom be-
cause we're showing a real need for them.

Lt. Col. Abrams

If I could go back to my slide that said, "measure the skill
transfer," which created this discussion, I had something a lot
simpler in mind than testing the ability of the device to give you
a skill that's going to be tested in another environment. For
example, on the test on the unit conduct of fire trainer on whether
there was skill transfer, what they compared the people who trained
on the UCOF on was when they went out and shot Table Eight. Well,
the fact of the matter is there are some skills you get on the
UCOF that you can't test out on Table Eight. There are things you
can do on the unit conduct of fire trainer you can't do out on a
range. The M-1 tank can go 45 miles an hour and shoot on the dead
run. We don't have a range big enough to do that, with the pos-
sible exception of the National Training Center. But you can do
things like that on a simulator. All I had in mind was, couldn't
we build in a test into the unit conduct of fire trainer, a kind
of self test of the individual, so that when he has finished his
training on the unit conduct of fire trainer -- two hours, four
hours or whatever -- we test him on the UCOF and see where his
skill is now. That's what I had in mind, not something that is
done long before we ever produced the UCOF, but after it's fielded
have a test built into it. The same thing goes for MILES. We
know that it works, but we don't have any tests for platoons right
now that show that before he goes out and trains with MILES versus
after he goes out and trains with MILES, there was any improve-
ment.

Comment

I don't know how many of you have flown American Airlines re-
cently, but having gone out to Dallas and looked at their training
program, I didn't realize that there is no such thing as flying
an empty airplane. The first time those guys fly, take off, and
land in American Airlines, they have been certified by FAA on the
simulator. The first time they land and take off in the airplane,
you're in the seat -- you're a passenger. That's the kind of
proof of the pudding in transfer. I'm sure that the rest of the
industry is the same way. We need to qualify and test people on
the unit conduct of fire trainer, for example, where we have units
that can only fire once a year and they have to go to war in 9
days, we've got to be able to keep up their skills using that. We
can't afford to do it any other way.

I believe we have a GE bulb now, so let's get Plus One back up
there.

Lt. Col. Hopkins

Now that they've changed that Sylvania bulb, we'll move on.

As I think most of you know, the conduct of fire trainer will be produced in three versions -- the M-1 tank in the upper right hand corner, the M-60 tank and 60-A3 tank on the lower left, and the Bradley fighting vehicle in the lower right.

This is the production lay-out right now that General Electric has selected. The conduct of fire trainer will be produced in two versions -- one that will be located in the battalion and will support the battalion commander in the training of his 58 tank crews, and then the institutional trainer will be located at Fort Knox and in . . ., and these will be unsheltered versions. The ones that will go to the battalion will be a complete system, as you see here. It will be housed in three shelters. The visual system, the image generator, which is housed in those three cabinets, and then your general purpose computer. Over to the right, in this shelter, will be the crew station, the instructor station with everything that he needs to perform his duties as an instructor, and then located in this shelter will be pre-brief and debrief rooms located here and then a maintenance area located there for the GE technician to perform maintenance.

The commonality between the three units is 85 percent. The major difference, of course, however, is the crew station. Your difference is in your crew station. In this particular case here, you see the crew station for the M-1. Those who have been in the M-1 tank could recognize this, the replication is very, very similar. Starting at the top is the commander's location; this is his forward unit window located here; this is a 32 degree field of view for him. The targets appear within that window, so they are detected there, which starts the initiation of the situation. He then, of course, uses the normal techniques that he would in the tank, lay the weapon for direction, bring it into the field of view of the gunner -- his side is located here, his primary sight -- and for the crew to go ahead and engage and defeat the target in the time standards that were established for it.

The primary site is located here, the auxiliary site over here, the computer panel located here, thermal up in here -- all the switches and controls operate just as they do in the tank. The crew must go through their prepare-to-fire check, just as they do in the tank. With the M-1 tank and the A3, and with any fighting vehicle, of course, if you're going to get the maximum out of that system, you have got to do your prepare-to-fire checks properly. The M-1, with all this sophistication and the tremendous weapon system that it is, if the crew fails to in fact do a computer self-test, if the crew fails to do their MRS adjustment as frequently as they should, if the crew fails to check their bore sight data and their zero data and to input their manual data,

they're not going to get the maximum out of that weapon system. In many cases, they will not be able to get any effectiveness out of the weapon system. So all of these are planned into the program and, as indicated, the system does function just as in the tank.

This is the instructor station. We've taken into consideration that this individual sitting here at this instructor station will be the platoon leader or platoon sergeant. We recognize that this is a very busy individual and that this will be an additional duty for him to perform these duties. As a result, we have provided him with all the aids that we feel that he needs to effectively train his crews, and we have also simplified it to the extent that he can come in on an interim basis as the instructor after he has received his initial training, and be capable of handling that system without any difficulty at all. The major features that he has available to him, of course, we've located him with access to the crew station where he can reach in, if he needs to. However, the likelihood of that is that he rarely has to do this. He's able to talk to the crew using the intercom system. He can monitor the sights for the commander and the gunner what they actually see, so that when they go from 3 power to high power in the gunner's situation or in the primary site to the GAS, he knows exactly which sight they're on.

Down here we have a CRT display, which he uses to talk with the general purpose computer to log onto the system, to tell the computer which crew is actually in training at this particular time; the print-out of the scores of the exercise are presented to him here at this location so he can evaluate their performance in real time. At the end of the exercise, he has the capability of printing the score sheet and asking for a detailed summary of their scoring, which he can take out of the trainer into the debriefing area after the training session and not take up valuable gunnery training time during the training session.

The technique, as we visualized that the battalion would want to use the system, is this. The training session, we feel, based on our use of the trainer thus far, is approximately 1 hour in length. During an hour's time, the crew can fire approximately five exercises of ten targets each, which means in an hour that the crew has engaged approximately fifty targets, fired fifty to sixty rounds of ammunition. That's not just putting rounds down range. This is really firing at targets that move as realistically as we can portray, as we would expect they would be moving on the battlefield. They are not moving on a track and they are not moving at a constant speed, but they are moving as an actual vehicle, as General Sunell mentioned in his test, which is very difficult to hit.

The training session would go something like this. The first group in the morning would report to training 15 minutes early. Prior to that time, the instructor had checked out his

system to make sure that it is fully ready to go. He has reviewed the crew's records from their last training session and he has formulated his plan of what he wants to accomplish that day. He pre-briefs the group, outlines what they are going to do, moves them into the crew station, has them do their prepare-to-fire checks, check out their system while he is logging that crew into the computer, and then he will then go into the training. At the end of a session, or while this group is in here, another group would report for training 15 minutes early and receive their pre-briefing. As soon as the hour session is completed, these groups exchange places. As you can see here, by using two instructors, you have the capability of keeping this system operational and warm all the time and not have any dead time in the training day. With 58 crews competing for time on the trainer, you can see the need, of course, for this.

I'd like now to move into the instructional system here. A little bit of a background -- when we started the program in 1979, the Government indicated they wanted the capability to train these types of crewmen; basic, cross, transition, and sustainment-- with emphasis on the sustainment, of course. As we did our initial work, the first thing we had to do -- keep in mind, this was a competitive program and it was titled Skunk Works Program -- and General Electric was in competition with Chrysler with very little guidance from the Government. We were told that they wanted a trainer that trained in the critical gunnery skills required of a M-1 tank crew. When asked what these critical gunnery skills were, they said, "That's part of your problem, to define these critical gunnery skills." To begin with, we first had to determine for ourselves what is this UCOF training mission. As indicated here, and I'll read it for those in the back of the room because it is small, is to develop or sustain the individual -- and here we're talking about the tank commander and the gunner in this trainer -- gunnery skills to a level of proficiency that, with minimum training with other crew members, the crew can meet the established standards for trained crews. Now, the key point here -- minimum training with other crew members. Obviously, the M-1 tank has four crew members, and the driver and the loader play an extremely important part in getting the maximum effectiveness out of that particular system. So in your training program in which the UCOF is used, there has to be provisions where at some time you bring the other four crew members in as team members and you do some sub-caliber work, you do some crew drill work before you actually go out and do your Table Eight live firing. This is the way we would view it here. During our front-end analysis, these are some of the key references which we use. I bring this up for one thing. First of all, we're developing a trainer for a new system, a system which was changing as we were doing our work; a system in which the Army was developing new techniques and tactics of using that particular system. During the time that we were working, this particular draft manual right here, the M-1 tank gunnery manual, there were three versions that came out. Anyone who is doing a

similar type work to what General Electric does, I would recommend to you that you have to work closely with the user, stay abreast of the changes in order to meet what it is they need at the production time of the system.

As part of our task analysis, you heard up here a discussion of evaluating what tasks it is a trainer must be able to do. Of course, we did this as part of our methodology. On the left hand side, you see what it is that the tank crew has to do. He has to be able to fire his main gun, his coax, his caliber 50, and smoke grenades. He's got to be able to do it in a normal mode of operation, emergency, manual, and . . . . He's got to be able to use precision gunnery techniques, battle site gunnery techniques, and do all these things in day, night, reduced visibility, and, of course, in NBC conditions. And across the tank, their own tank and target motion, which he has to be able to perform in combat. He's got to do it stationary/stationary, stationary/moving, moving/ stationary, and, of course, moving/moving. And when he's in a degraded mode, he has to be proficient in operating and firing using a short haul technique. This task analysis led us to our exercise library that we developed to be used with the UCOF. And we then categorized our exercise into three groups; special purpose exercises, commander/gunner exercises, which they do as a team, and then the commander exercises.

Special purpose exercises consist of these. For the sustainment crew, a trainer introduction orientation -- this is about a 20-minute orientation to the crew to show them the differences between the trainer and the tank and to let them become familiar with the peculiarities of the trainer. The next one down is transition cross and basic crew orientation. Now, these crews are not familiar with the M-1 tank and this is about a 3-hour taped exercise where we actually are capable of teaching the controls and switch and knob . . . of the M-1 system and how to use it. Preparation of crew station for operation -- the . . . and screening test -- most of you are familiar with the terms bore sight and zero, but it's changed now on the new system. Coax zeroing and the bore sight and zeroing are the commander's weapon.

Continuing on into the special exercises, we provide acquisition and manipulation exercises for those new gunners to let them develop the eye/hand coordination before you throw the whole problem at them. These are the characteristics of those exercises.

We've also included in our library, exercises for the commander, acquisition and manipulation exercises under these conditions for a new commander or a gunner's transition to be a commander or a cook that's being transitioned or reclassified into a tank MOS to be a commander.

This brings me now to the gunner/commander exercise. I know this is small, but I want to use it and use the color code to explain what we have here. Our goal, when we started out, was that this trainer should be an effective trainer. That is, we knew that there would be 58 crewmen competing for time on the system, and it had to be able to take these crews to a proficiency level that was required by the Army and sustain them in a minimum amount of time. With one trainer and that many crews, you cannot waste training time. You cannot afford to give crews the training which they already know how to do, and if you have crews that are up to proficiency level you're looking for, these should be able to be identified to you and, in fact, you can allocate training times for the crews who need it more. As a result of this, rather than a syllabus approach to training, we came up with an adaptive approach to training. If you recall that task list, we had the conditions that they must be able to perform all these skills under stationary/ stationary -- we've provided here a group of exercises that are all stationary tank exercises. The targets are stationary, and they progress in difficulty as you move this way in the . . . aim requirements here, where everything is operational day to night conditions to NBC conditions to where the stabilizations fail, the laser range finders fail, and then finally you get up to a point where all the components have failed and the only thing you have left are your manual controls and your GAS. We really have taken each exercise and broken it down into four scored areas -- target acquisition, . . . aim, system management in that he has his switches in the proper place, and crew coordination. We take these first three skill areas and use this as part of our adaptive program. We've organized our exercises here in this matrix, as I indicated, in three dimensional area. As you move diagonally across the top, exercises become more difficult in target acquisition. As you move vertically up, you move from short range single targets to long range single targets to short range multiple targets to long range multiple targets. As a result, the exercise becomes more difficult, both in . . . aim and system management. As you move across this way, your exercises become more difficult in . . . aim because you move from stationary own tank/stationary targets to stationary own tank/moving targets, moving own tank/ stationary targets, and moving/moving situations. Finally, in this tier out here, you have as close as we can to replicating what the combat is, as we can anticipate the crew will encounter. So a crew begins back at the block here for sustainment. Based upon their scores and target acquisition, system management, and . . . aim, they then move to a more difficult exercise. What this is is let each crew move at their own pace. In other words, it is adaptive to their requirements. And if they are having difficulty in . . . aim, but doing well in target acquisition, they will move over in this axis. If they are doing well in all three axes, they will move generally across like this. Our goal is to

get the sustainment crew up to a proficiency level up here in a relatively short time.

We have a similar matrix for our commander exercises, where they will be required to fire exercises from their position both for the main gun and the coax, and also for the caliber 50. We recognized, as Colonel Abrams indicated, the requirement for evaluation exercises. These will be placed in here so that the training manager can, in fact, evaluate his crew at any point as they move through that matrix and determine what their weaknesses are to see if he needs to adjust their training program.

The instructor is relieved of the requirement of determining what exercises will be fired, as it is all handled by the computer for him. He has an override capability, where he can select exercises by content if he so desires.

And that, with the time I have, is probably where I had better stop on the UCOF.

BGEN Sunell

Thank you, Dick. The reason why I asked Dick Hopkins to give this presentation is becuase this is a case -- and I speak tank gunnery because it's the one I know the most about -- tank gunnery experiences have been like this up to this point. It's been in a lane, and we haven't been able to shoot the 240 degrees that we would find on the battlefield. So the UCOF actually becomes a more difficult drill than actually going out and firing Table Eight itself. So our goal has to do with something that Bill said earlier -- we hope that the individual crews will qualify first on the trainer as they do on the FAA trainer for civilian airlines before they ever go out and fire their first main gun round. If they can't qualify on the trainer, they shouldn't be permitted to shoot that $2,000 round down range. That's the goal that we're headed towards. So as we look at things, we want to make sure, as I said earlier, the task that we're trying to teach, we want to make sure that that then leads to full qualification, and then we can maintain our proficiency. That was the purpose of having that embedded training program briefed today because we think it's a step in the right direction. I'm just sorry that we, the users, didn't do it ourselves and have been doing this all along.

With that, the few minutes that we have remaining are open for questions.

Question

I just wanted to make sure that we don't have a misunder-standing of terms. I heard the term "training transfer" used and then the explanation of what was meant does not really agree. The term "training effectiveness" is what I think Colonel Abrams was describing. Training transfer is a differ-ent thing. We, in the past, have bought equipment that had high training effectiveness, but when we went to actually trans-fer that learning to the system, we had negative training trans-fer. Training effectiveness is how well that particular device trains the individual to do a skill on that device. Train-ing transfer is the actual taking of that skill and moving it to a piece of equipment and being able to use it. I want to make sure we don't get the two confused. There are, again, ORSA techniques which will allow you to do this training trans-fer evaluation without the extensive manpower requirement that some ORSA people desire. It just takes a very careful look at what the requirement is and designs that test appropriately.

BGEN Sunell

Spoken like a true ex-member of the Army Training Support Center.

Question

How would you handle the NBC in the trainer?

BGEN Sunell

The only way that you would handle the NBC in the trainer is if you had to use your NBC equipment. In other words, your filter system, and that poses a problem in that you have to be able to use it through the mouthpiece.

Lt. Col. Hopkins

He trains on it just like he does on the tank or on the Bradley fighting vehicle. He uses his gas mask with a col-lective protector . . . .

Question

I think one of the thorniest questions just touched upon --
and General Tice mentioned it yesterday, also -- was measuring
performance or training transfer. I can see an infinite money
sink in that particular endeavor. When you stop and think about,
say, the drug industry, they always have to establish a control
group. To take a group and run them through without the simula-
tor and then to run them through with the simulator and measure
the difference, they've already had one set of training. You've
got to pick two groups and I think this whole psychology of
control group and so forth -- I wonder how much of that we can
afford and is it really a user requirement to do that? It's
really to convince Congress that you need to buy the simulator, I
think.

Colonel Campbell

If I might just throw in here, we had a long discussion on
that this morning, because as far as I'm concerned, that's what
we're doing it for. We're trying to tell somebody else who looks
at a bunch of numbers and says, "prove it to me." As Tony Battista
was so right to say yesterday down at the PM conference, "You
guys have got to do something and get something out in the field,"
but I say we can't get it if we can't make anybody in the estab-
lishment believe that it's good. You don't go on gut feel anymore.
You're not a soldier with an experience factor and knowledge and
smarts. It's got to be by the numbers. The conduct of fire
trainer -- we went through OT and we had one heck of a lot of
trouble in doing enough replication. And we didn't even have a
window. We had to force a window from General . . . in order to
get the time to train, to get the soldiers and the time to do
that. The money's not there. I don't know what the solution is.
It's a thorny problem; it's a sink hole. We started to talk
about this at the Executive Session on Monday afternoon. It's
just an absolute bog.

Comment

I would also like to say that we haven't been completely cap-
tured by the ORSA community. After X number of years of experi-
ence, it tells you if there is training transfer in a piece of
equipment. We are looking at equipment without using control
groups on training transfer because we can see exactly what's
happening by our own experience. Let me give you a for-example.
The Bradley trainer -- under the computer game concept, we put an
11 year old boy on it who is a good computer expert and inside of
three hours, this is what he learned. He learned to identify
friend or foe, because if he shot friendly vehicles, he lost
points. He learned to engage weapons and other vehicles by

selecting the correct weapon system. He didn't shoot at tanks with a 25 mm because if he did, the tank, after 8 seconds, would shoot and kill him and 3 kills and he was out. He learned to use range, because he could learn to use the range stadia. He only had X number of TOWs that he could shoot. Once they were gone, he couldn't shoot anymore. The fourth thing was opening times -- if he didn't make all those decisions and open on time, the opposing force vehicle would kill him and he'd get no points. That youngster learned to do that and was manipulating all those in a very, very short period of time. I don't have to go and spend a million dollars to say that there is training transfer in that particular box. And we would go with that without being captured, as I say, by the community that says we have to have thousands and thousands of replications to make sure that we have transfer. There is a lot of common sense involved there.

Question -- (Cannot be understood)

Comment

We have a requirement downstream for platoon level trainers, where you would put a group of these particular devices together and train platoons, qualify platoons on them. Again, it is my contention that the MACE, . . . and CATS -- those are user requirements for training battle staffs. For training above a battalion, we have our war games. I don't know how better to answer your question than that.

Comment

There are a couple of things that have been said by the aviation community -- this is not really collective training in the large sense, but you're talking about the battle captain and the . . ., COBRA, putting them all together. That's an expensive proposition and we're trying to figure out how to do that.

Comment

Then you've got the VENT-2 exercises going on, also, at the current time, where you're actually playing through video an entire platoon operation.

Comment

If I could add a couple of things -- one is that we'll start to field that multi-purpose range complex in 1984. That will get you a fairly well orchestrated, programmable target array and so on up to company team for live fire, and that gives you a good combined arms exercise. The other thing is, don't forget the MILES, which is a collective trainer, not just an individual trainer and one of my points of measuring the skill transfer was to establish a MILES platoon test. The final thing is that DARPA is working on something a little bit more extensive which they hope to get put

together by 1986, which is almost in the Buck Rogers realm, but it is a very extensive collective trainer that goes down to individual levels.

I believe that we've just about run out of time, but I'd just like to summarize and say that the name of the game is substitution and miniaturization and simulation, whether it be collective or individual tasks. That's what we're working on and that goes from everything from -- I'd like to go back to Will's comment and it says, "does it transfer?" If I have zero, it transfers nothing. If I have a wooden mock-up, it transfers something. That's the kind of approach we're taking to it. We look at each one of the critical tasks and we're asking ourselves a tough question -- does it train these tasks and can we take this and go from this wooden mock-up and get on the tank and do the kind of hand manipulation that we need to do.

With that, we'll close out the user panel on time and thank you all for attending it with us.

SESSION IVA

U. S. AIR FORCE USER PANEL

Colonel R. Baker

. . . . . He has held that position since July, 1981. His
responsibilities include policy control and day-to-day manage-
ment of all Air Force technical training programs developed and
delivered by the Air Training Command. He has an extensive back-
ground in the personnel and training policy arenas and he has a
strong orientation to user needs in the field or well-trained
technical school graduates. Prior to joining the Air Training
Command, he served as the Deputy Director for Personnel Programs
at Headquarters, Air Force in Washington, and he has also held
responsible positions in Tactical Air Command as Commander of
the 27th Tactical Fighter Wing and later as Deputy Chief of
Staff for personnel at Headquarters, Tactical Air Command. He's
a command pilot with 220 combat missions, including 63 over
North Vietnam and he has received many awards, including the
Silver Star, the Legion of Merit, and the Distinguished Flying
Cross. He's been smiling a lot since yesterday morning, when
he was informed that he was nominated for selection to the rank
of Major General, and he, this past summer, served as a key Air
Force participant in the Defense Science Board Summer Study on
Training and Training Technology that some of our previous speak-
ers have referred to. He shared with the Board his insightful
grasp of the problems, the issues, and the opportunities involved
in the delivery of quality training programs. I'm sure you will
find his comments and those of the panel this morning informa-
tive and useful. Please join me in welcoming Brigadier General
Thomas J. Hickey.

Brigadier General Thomas J. Hickey

Thank you very much. I didn't know I had so many insightful
things to do at the Defense Science Board. I thought it was
more like an alley fight most of the time, as we discussed the
pros and cons of training and training devices and training
issues.

I know, from what I've seen so far within the conference,
that there are diverse interests within the audience here today.
So to give you a heads up and keep you from wasting time in a
panel session or a user session that may not lend to your parti-
cular interests or your particular concerns right now, I need
to tell you up front that what we propose to address and deal
with during this session are training systems, simulators, those
kinds of things, keyed towards maintenance training, not neces-
sarily operational flight trainers. There have been other
panels that have addressed that. Not the operational kind of
training simulation that we just heard from the folks in the
Army user panel. But we're dealing on the maintenance side of

the house, and we're talking about both those training systems
which are not associated with major weapon system hardware, as well
as the ones that are associated with major aircraft systems that
we're bringing onboard. So if that blows your mind and turns you
off, you can run around and catch another panel before they get
going too long.

On the other side of the house, I would hope that you stay. I
think that there are two reasons for our addressing maintenance
training and maintenance training devices. The first is the fact
that those other kinds of aspects of training have been covered in
other panels and the more cogent reason is the fact that I'm the
maintenance trainer and that's what I want to talk about, because
that's where my primary concern is. So we'll beat our drum a
little bit and deal with that in here.

We see computer driven simulators within the Air Force Techni-
cal Training world as a primary focus for maintenance training in
the foreseeable future. Our experience to date has been somewhat
limited and bluntly, we've had a mixed bag of successes and fail-
ures. Quite often, the equipment that we're trying to buy, we
have trouble defining. We don't know exactly what it is that we
want. Unfortunately, the people that are working in the procure-
ment side of the house aren't able to interpret what we don't
know, either, and then that causes the same kinds of problems for
the contractor. The bottom line is what that usually ends up in
terms of results is that the equipment gets to the field late and
not only is it late, but it usually costs a lot more than we had
planned or budgeted for. So in some ways, bringing maintenance
training simulators and other training devices onboard has been
described as giving breech birth to a giraffe.

However, once we get those devices in the field, we have dis-
covered, and they're on the scene, they're really and truly very
beneficial. That's by every measure that you want to talk to.
They have reduced the demands for operational equipment to train
on and we leave the aircraft and the support equipment and the
aids and all those things that are out there on the ramps of our
operational wings to their primary mission, which is producing
sorties and to getting on with their operational part of the
business. Not only do we reduce the loads on the operational
equipment and the demands for that when we have good maintenance
training dedicated equipment, but we find that we do better and
more comprehensive task qualification and technician training
when we have equipment that is dedicated and designed to do that
training task. So therefore, we're convinced that it's the way
to go and if that's the way to go and we have trouble getting the
stuff onboard in some kind of a timely and cost effective manner,
we have to clean up our act on that side of the house.

We need to establish ways to reduce the whole time process
that is assumed by acquisition and the full spectrum of what
that means, and we need to do a better job of getting those

devices in the field without paying an arm and a leg or making them more expensive than the original equipment was.

We have a great need, in our view, to keep our people combat ready, both for today and for tomorrow. As Colonel Abrams said in the last panel, it's probably going to be a come-as-you-are war and while that is, from an operational and crew training point of view, very important, it is also the same in terms of maintenance of those weapon systems to be able to turn, generate large numbers of sorties in short periods of time, loading bombs, all the mundane things that make a unit combat ready organization. And we think that proper training is the key to being ready for that kind of process and we need training equipment to do it.

It should satisfy the user needs in order for it to be effective and that you've heard before here today. It also needs to be reliable and maintainable, as well as affordable, and that means we don't need any of the unnecessary frills that are there. We need things that allow us to have capability to improve our troubleshooting and maintenance training capability on that equipment and then transfer that to the operational gear.

We are constrained to put our dollars where we receive the most pay-off and bluntly, we have run a track record where we have trouble defining what the pay-off is, as was also discussed earlier, and we'll talk about that a little bit.

Finally, I'll just say that we in the Air Force solicit the help of industry in solving the myriad of problems that we have there and we'll want to talk about that a little bit.

What we propose to give you is our perspective on those issues, first from what from us, in our business, is the user point of view and that is the people who are, in fact, conducting the training, both in the resident schools and in our field training detachments, and from there we'll move to those folks who are involved in the acquisition process in terms of requirements determination, programming, and procuring the things we need.

So to start through that process, the first panel member that I'd like to introduce to you is a user, in our view. He is the Wing Commander of the 3330th Technical Training Wing Resident School at Chanute AFB, Illinois, Colonel Joe Shanahan.

Colonel J. Shanahan

I'm happy to speak to you about the technical training business today. I have over 26 years' service in the Air Force. The first four of it, I started off as a very basic user. I was enlisted for my first 4-1/2 years. I have extensive experience in the various major Air Commands in the training business. I spent a lot of time in Tactical Air Command and in the Special

Air Warfare Center training for various old airplanes to fight in
the Vietnam conflict. The last 7 years or so I've been in Air
Training Command. I was the Chief of Training Evaluation at
Lowery Technical Training Center, Director of Personnel there, and
I'm currently, as General Hickey said, the Commander of the Tech-
nical Training organization at Chanute AFB.

Air Force technical training needs your help -- I'm speaking to
industry -- in that we have a system whereby the user and the
technical training people agree to what you might call a contract
of what we're going to train. We agree that the final product
will be at a certain level and we train to that level. Now, the
user doesn't really care how we get the individual to that level.
If you have methods and ways and training devices out there that
can help us and assist us to get that individual to that required
level quicker and more cost effectively, then we'd like to hear
from you and hear about the techniques and devices you have. That
can help us a lot.

I'd like to discuss right now some of the current problems we
have and maybe some of the solutions that we hope you may be able
to come up with.

Training equipment use rates most often exceed the operational
use rates. What I'm saying is that daily, repetitious use by
unskilled students cause problems in our equipment. I'll give you
a few examples of that. In our Fire Protection Training School,
we use our fire trucks to train our fire fighters. Those pieces
of equipment are used approximately 10-to-1 over what the equip-
ment is used in your local fire department. We actually wear out
bolts and fasteners in a school in our wiring techniques and in
our safety wiring exercises. We actually wear out the bolts and
fasteners. We've had to replace nuts and various devices on our
jet engine trainers because of the use by the students. In our
missile training, our mating and demating of the equipment there,
the use rate is about 100-to-1 over what it is in the field. I'll
give you some examples of the problems that we have in the school
business.

Our equipment must be, as you might realize, very maintainable.
We must be able to keep the equipment in good repair and have it
what we call "rugged-ized" so it can handle the constant use by
the students and instructors in the training programs. We also
need a system that we can use aircraft technical data. Our tech
orders are a great asset to us, since they're used out in the
field, and it's very beneficial that our technical orders can be
used when we go through the various exercises on the various
trainers that we have.

Our training equipment should be kept configured as much as
possible. That is, we need equipment as similar as possible to
what is used in the operational organizations. The more realistic

the training is, the more advantageous it's going to be to the knowledge transfer to the student. We need equipment and hardware that is as similar as possible to what's out in the field. Obviously, we cannot afford to have a classroom area full of every possible airplane that we have in the inventory, but what we do need is equipment that will train the various systems used on those aircraft. Many times we use what we call "generic" training in the technical training business -- something that gives the student the basic familiarity with the various systems he'll be using out in the operational career area, and a follow-on speaker will talk to you about what happens when they get out there.

We also have a problem of getting our equipment on time. As you may hear from other speakers or from the other Services, it's very important that we have the training equipment on time to be able to use it, especially when new weapons systems come onboard. It's critical to us that the trainers be there, really, from our standpoint, before the first operational unit gets off the ground. We need to be able to train those first maintenance people to get those planes in the air. We want to maintain ourselves, obviously, as combat ready as possible, but no matter how well we train our pilots, if our maintenance people who maintain and support those aircraft are not properly trained on the right types of equipment initially, then we're going to have problems.

In summary, I would like to say basically, training equipment must be extremely durable, student-proof, and able to meet mission requirements. Also, it must be configured and representative of the weapons system it supports, and meet the training need dates.

Thank you.

BGEN Hickey

Colonel Shanahan has kind of covered the aspect of where those basic students are going through resident schools. His concern is putting them out into operational units as a usable product for the operational commands and as productive workers. Quite often, however, the next stage that occurs in this whole process of training to a fully qualified technician carries through in the field training detachment, and so we sometimes, in the second stage of our user role, are the first to enjoy or not enjoy the results of our efforts in the resident schools. To talk to you a little bit about the field training side of the house we have Major John Evans. Major Evans is currently in the Systems Division of the 3785th Field Training Group, the headquarters for all those field training detachments stationed at Sheppard AFB, but until very recently he was the Commander of the Field Training Detachment at Hill AFB in the F-16 Wing up there.

Major J. W. Evans

Thank you, sir. What I'd like to discuss today is basically some of the problems that are faced by just about every FTD Commander throughout the world when it comes to using some of the training equipment that is provided to them to conduct that on-site training.

In many systems, one of the options that is generally proposed for use of training by the Field Training Detachment is the use of operational equipment, and I'd like to discuss some of the problems that those FTD Commanders and Instructors face whenever that particular option is exercised.

In the first place, many times the aircraft is not available because, from a maintenance standpoint, they have to be provided to the operators to fly in their training schedules to train the pilots. So if you take it and do maintenance training on it, then you have deprived a pilot of some of that time that would be available for him to use to improve his skills.

The next problem encountered is that if you take it off the flying schedule or take it out of the maintenance, you in some cases degrade the unit capability status. Whenever you do that, then, of course, the Wing Commander has to answer to his higher headquarters as to why he is not as fully operationally ready as he should be. Many times, also, the aircraft are needed to conduct actual maintenance. In other words, the aircraft that you thought you were going to get for training is broken and is scheduled to undergo actual maintenance or it is scheduled for a periodic inspection, and so it's not available for that reason.

Oftentimes an instructor will go out and use a plane that has been scheduled for maintenance training and find out that the particular problem with that aircraft is that the system that he needs to train on is broken, and so it cannot be used. That is something that is faced almost daily out in the field training world. And, of course, one of the big problems we face is that whenever we do conduct training while using an operational aircraft, because that system is being exercised, it often breaks while the training is actually being conducted. Then, of course, if it's something serious that can't be fixed, you've got a previously operationally ready aircraft that is now broken and has to go in for scheduled maintenance.

There are problems with some of the systems in that if you're going to do egress training, for example, many Wing Commanders and DCMs and even the instructors themselves do not like to conduct training using a live egress system. Of course, there are a lot of problems associated with that from a safety viewpoint, but in addition to that, you do maintenance on an egress system then there are a lot of additional checks and inspections that have to be conducted on that airplane before it can be flown

operationally again. For that reason, they're very reluctant to give an airplane up for egress training.

Finally, the airplanes many times are needed to support local exercises, operational readiness inspections, and aircraft genera- tion exercises. All of these things that are discussed go into reasons why we sometimes cannot even get the airplanes that would be needed to support that training.

Another major problem area is the support equipment that is used on the flightline. We also need that same support equipment to conduct our field training. One of the problems that a lot of units face is that not all of the authorizations for that support equipment are filled, and so they are in very short supply. They may have only four of ten power units that the Wing is authorized. In many cases, there are high out-of-commission rates, particularly for the . . . that is needed for training. Again, many of the support equipment items are needed to actually support opera- tional missions or the maintenance itself, and if you have to make a choice between training and maintenance or operations, you know which way the Wing Commander is going to go. He's going to support his actual mission. Another thing is that a lot of times that support equipment requires calibration or repair, and in many cases that can be a very long cycle if it's got a problem that needs a new part. We've encountered some examples where it would take as much as 6 months to get a piece of test equipment calibrated and repaired.

Another major problem with using host support equipment and the actual operational system is that it requires an extensive coordination with the host unit in order to make that time avail- able on that piece of equipment. In addition to that, in many cases if we use the actual unit's equipment, we have to use their maintenance shop to conduct the training and any maintenance shop or flight line is not a good academic environment, and so we actually need the trainers down in the FTD to conduct training in a learning environment, where the students can assimilate the training much easier.

One final problem that many units face in the Field Train- ing Detachments is that in order to use the operational equipment it requires that they transport support equipment and test equip- ment down to the flight line or to the maintenance shop and most Field Training Detachments do not have the vehicles to support that kind of transportation requirement.

So there are many inherent problems with actually using operational equipment and for that reason, the Field Training De- tachments are, in many cases, not willing to or cannot use that equipment. So it's not really a viable option.

Another major area that I'd like to discuss is using the outdated or unconfigured training equipment. Whenever an

instructor has to use training equipment that is not kept current
with the operational system, his instruction is complicated and it
extends, in some cases, the training time in order to teach the
differences between what the student is seeing on his out-of-date
trainer and what he's going to see when he gets out on the flight
line. That's a very real problem. In some cases, the students
are TDY and there is a time limit for getting them out to the
unit that they're supposed to go to, and if we have to extend the
training time, then we've deprived that Unit Commander at his
final destination of a body that he needs sorely to do the mainte-
nance itself.

Also, another problem with using outdated equipment is that
the students are often confused between what they see in the class-
room and what they will experience when they get to the actual
units that they are going to be working in. In other cases, we
have found problems that we could not even use a trainer because
the systems are so different, and in order to do the training, we
have to just more or less talk around what the student is going
to see out there on the flight line. We can't even use the trainer
as a show and tell. We've experienced that quite often in some of
the avionics training in the F-16. It's not even compatible with
what's on the aircraft.

Another problem is that if the trainer uses some of the support
test equipment that is used on the flight line in order to conduct
some of the training, in many cases that test equipment has also
been modified to be used on the operational aircraft and is not
even compatible with the training device itself anymore. So that's
a very real problem. So we must make sure that the trainers are
kept current with the operational system. Otherwise, we do run
into an awful lot of difficulty in trying to support that training.
Of course, with some of the more recent computer-driven simulator
equipment, as with the F-16, there are some inherent problems with
that, particularly with the software. If you have some dynamic
parameters that are hard-wired or embedded into the programs, it's
very, very difficult to change those and in many cases it takes as
long as 18 to 24 months to get those changes incorporated into the
trainer. The whole time you're doing that, you're having to teach
around the trainer and cover the differences between what is
actually in the tech-ware that the student is going to be using on
the flight line and the one that he has to use in order to conduct
the training itself.

The baseline configuration that is used in some of our trainers
requires the maintenance of actually two complete sets of tech data.
If they use the actual checklist that they're going to be using on
the flight line, we have to keep two sets and one of them is com-
pletely outdated because in order to operate the trainer, they have
to use the outdated tech data, and then when they go out to the
flight line, they see something entirely different. So we can't
teach them to use the tech data that they need out there on the
flight line.

Finally, one of the problems with the software is that in many cases it is not tied to the actual system modification, and, as I said, there is a 1 or 2 year lag in getting it updated. That poses a very serious problem.

So those kinds of things need to be taken into consideration when a company is designing a trainer to be used in the Field Training Detachments.

BGEN Hickey

Thank you very much.

From those two perspectives of the importance of having dedicated training equipment and its impact and some of the parameters which make it more useful and have greater utility for us, we'd like to turn now to some of the things that happen within the acquisition process. Usually, the first step in that whole process is a task analysis and a requirements determination and kind of a molding of what that training equipment is going to have to look like to fold into the operational equipment that its going to be designed to support. That's a very difficult job. It takes a lot of patience, a lot of smarts, and we have discovered over time in the Air Force that if you've got a hard problem like that, you turn it over to a sergeant someplace. And so, to describe how we do some of that process within the Air Force, I have Senior Master Sergeant Dennis Kox here from the 3306th Test and Evaluation Squadron at Edwards AFB, California.

Senior Master Sergeant Dennis Kox

Thank you, General Hickey.

Good morning. We're assigned to Air Training Command's Test and Evaluation Squadron out at Edwards. There, we're responsible for the identification of training requirements, as well as recommending training and training equipment to support those requirements for new weapon system acquisition. Our principal tool is the famous -- or perhaps infamous -- ISD process.

With the exception of a recently-completed one-year operational tour in Korea, I've been at Edwards since 1973, and as such have participated in the development and application of ISD in the definition of training equipment for numerous weapon systems. During that time, one of the greatest problems we have faced is basically one of concurrence. By that, we need to identify specific training equipment requirements very early in the acquisition program and with very limited time. For us in the ISD world, directed early identification of training equipment to facilitate early budget estimates and/or long lead procurement presents the greatest challenge. We find that early in this acquisition process, the suitable data base with which to perform the ISD analysis generally

does not exist. Maintenance task data will always lag weapon system development and is not readily available from the contractor. Now, generally, we'll see that data start to evolve somewhere in the neighborhood of 6 months subsequent to the critical design review. However, that's still not early enough. I'm not saying that the data is not there. It's probably there in the form of engineering notes or something similar to that, but it's not in a neat, clean package that we can do an analysis on.

Additionally, we're faced with undefined maintenance concepts as well as very fluid trained personnel requirements in target populations. That's not to say that valuable ISD cannot be performed, but it does mean that the ISD effort will probably be limited, both in scope and depth and perhaps in quality. The result is a best-guess training equipment requirement due to ill-defined functional requirements that in turn can lead to costly or gold-plated, if you will, training devices with questionable training effectiveness. . . . .

Thank you.

BGEN Hickey

From the 3306th and that requirements point of view, usually those requirements start falling back through my particular Headquarters and Headquarters DCS at ATC, and Mr. Claude Laughlin who works in our Training Systems Directorate, will give you some aspects from his point of view.

Mr. Claude Laughlin

Thank you, General. I have been assigned since 1958 to the Resources Branch in the Systems Acquisition Directorate at Headquarters, Air Training Command. During that period of time, I've worked a great number of systems and other types of equipment to put out in our total ATC training environment. One of my major systems that I'm working on today is the F-16 program. The observations I would like to make today will reflect some of the ATC positions that we see have been happening in the last 5 years or so in new systems acquisition, and, of course, I'm going to have to repeat some of what has already been said because some of these are critical to our needs, some of the shortcomings of the various acquisition processes.

So up front, I'd like to state that overall, the system for the acquisition of training equipment for support of our ATC maintenance and operator training programs has not always been responsive. Training equipment, generally -- and I repeat, generally -- has not been budgeted, procured, developed, or delivered to meet our training needs. This has been attributed to many factors, which are all involved in the identification and acquisition process. Some of these factors I'd like to repeat here. Sergeant Kox has already

described the length of time required to complete the ISD process versus concurrency. Another factor is the lack of or the minimum support for justified training equipment requirements in the Program Objective Memorandum, or POM budgeting process.

Another factor is that contractual and production lead times for training equipment are generally too lengthy to meet our training need dates. A lot of these have been running in excess of 22 to 36 months.

Another factor -- the acquisition costs for training equipment have frequently been underestimated, particularly for the development of the software. When it's underestimated and we go to acquire the stuff and there's not enough money, then we've got a lot of problems there.

There have been delays in the contracting from year to year, and every time there's a delay, there's a great increase in the cost. In some cases, these get into megabucks. We also have a number of instances where contractors have accepted what we would consider to be unachievable contract delivery schedules and this results in late deliveries and when we have late deliveries, then we've got to look for work-arounds or we've got to take the equipment in a partial configuration and then work to get it up to a current configuration.

We feel that we generally do a pretty good job of stating our needs early in the system development and acquisition process, but the maintenance training equipment acquisition, modification, and support generally lags the system acquisition, modification, and support actions.

Another factor is that the training equipment funds are frequently diverted to other program elements within . . . or some higher Air Staff activity. And there have been very excessive software development times by the contractors and the vendors for the software to go into these maintenance simulators. Some of these times have exceeded 30 months.

Generally, the maintenance training equipment acquisition is tied to systems acquisition, but seldom gets the same level of priority as the end item within the system acquisition process. As a rule, maintenance training equipment experiences low visibility in the system acquisition, both within the Air Force and in industry. Somehow, our maintenance training equipment priorities must be brought up to the same level of importance as is currently now afforded the operational training equipment, because whenever training equipment acquisition, modification, or support is late, airmen will arrive at their end assignment not fully trained. In other words, whenever we can't get our equipment at our resident training centers, then Colonel Shanahan and his folks must push the graduate out to the Field Training Detachment and when we can't get the equipment at the Field Training

Detachment on time or to the right configuration, then that training is pushed on out to the operating commands for work-arounds. A nonavailability of maintenance training equipment at FTDs forces the use of aircraft, missiles, support equipment, and operational personnel to support the aircraft for training. This is a costly and inefficient use of the first line weapons systems and it does not necessarily provide the quality of training that is desired.

I'd like to reemphasize two or three points that the four of us have made already. I think the funding problems are recognized at all levels. However, the ground operator in the maintenance training equipment is frequently not readily identifiable or supportable in the many systems budgets and once it is included in those budgets, these requirements are often not supported or are not funded during the POM budget cycle. But once we get those in there, then too often the training equipment requirements, even though funded, are not placed on contract or they are deferred or they are cancelled by a higher-interest project within the system. And then unfortunately, even after we have equipment funding, quite often there is just too much time taken to negotiate the contract. When equipment fundings are cut or even cancelled in some cases without ATC knowledge, then we have a problem of developing impacts and additional work-arounds.

Another item I'd like to address briefly is the problem that all the major Commands have, and that is the funding and effective clear means that is required to identify non-weapons systems funding sources and to get some help in the identification and development of training equipment to support non-weapons systems. A good example would be the fire suppression systems that we have in all the buildings. We have a training requirement from the users to train people on the maintenance of these systems and yet there is no SPO, there is no common source to this equipment. Each engineering activity puts in the system that he is knowledgeable of or likes the best and it's pretty difficult to sit down and develop a trainer or a training system that will let us teach that type of system. That's just one representative type of non-weapon system training equipment where we need some help.

One other item, we find a need for more emphasis, both by industry and the Air Force, for adequate logistics support. We have a great deal of ongoing problems within ATC that are associated with the provisioning support and the configuration control of training equipment. Some of these provisioning shortfalls are wrapped around incomplete contractor drawings when it comes time for provision. This is especially true of the vendor data that is being passed to the prime contractor. There's just a great shortage of this or it's incomplete.

Another thing that we see happening on all the systems, or almost all of them, is that proprietary data, particularly for commercial items, is difficult to come by and that data is

needed not only for operation and maintenance handbooks, but for the logistics activities to be able to program and provision the necessary spares and modifications that are required or to keep the software updated.

Last, the training equipment is very frequently overlooked or not considered within the provisioning activities of both the Air Force and the contractor. So we have a problem of spares being short the program, mod kits being late. Too often the kits that are provisioned don't arrive until after the complete fleet has been modified, so it's pretty difficult to do an adequate training job before the fleet is modified if we don't have the equipment. When we don't have the equipment, again that increases our costs within the training and also within the operational environment in that we have to go out and buy interim contractor support or we've got to buy additional Type One training, and these are all very costly items. Then in the end, the user has to intensify his OJT which detracts from his operational support.

On the tail-end of this whole thing, the trainer life cycle is shortened. Fifteen years is our optimum life cycle program for any piece of system equipment, but if we can't keep it modified or we don't have the spares, then those trainer life cycles are generally shortened.

So, in summary, I'd like to say that ATC training equipment needs are only in response to our user's training needs. There isn't any doubt that industry does have the capability to produce suitable training equipment packages in a timely manner and at reasonable cost, and we find that once we can get by the budget and the negotiating cycles in this acquisition system, the worker bees out there at the SPOs and within the Logistics Command and industry can generally do a pretty good job. And if training is required, then training equipment must have a higher priority and it must be supported in the budget and the funding acquisition cycle. And it must be accorded more emphasis by each responsible element within the Air Force and industry. Now, we've got a lot of success stories in the training equipment, although it may not sound like it from what we've said so far today, but most of these success stories are attributed to a team of people working to find better ways and working with a positive attitude to succeed. The Air Staff, the Air Training Command, and I know the other major Commands are currently working to resolve the problems with the budget and the funding and we certainly solicit, again, your support in finding ways to accelerate the contract actions and then the development, production, and delivery of the training equipment to us on time. And we certainly solicit your ideas on how to find better ways to develop training systems and trainers. Thank you.

BGEN Hickey

Thank you very much, Claude. I've been fairly comfortable with all these presentations up until now, because I've got a string on all four of those guys. They all work in the Air Training Command some place or another. Our final panel speaker, though, has a little more autonomy and I don't know whether I should be as comfortable, but I think I am. Major Randy Godfrey is currently stationed over at FTAC at Patrick AFB, but he was kind enough to come over and sit in with us this morning. The reason we've asked him is not because of his current position, but because until very recently, he was in the Aeronautical Systems Division at Wright-Patterson and was involved in the acquisition process within the SPOs for training equipment.

Major R. Godfrey

Thank you, General. As the General said, now I'm in FTAC over at Patrick, but up until August of this year, I was the F-16 Maintenance Training Equipment Program Manager at Wright-Patterson. That makes me a little bit farther from the users than the rest of my colleagues, but I'd like to speak to you a little bit about some of the problems that I faced in the SPO in acquiring the training equipment.

I guess it's only suitable that I should come at the end of this presentation, because after these guys get through deciding what they want to do, then they beat on me so I'm always at the tail end of the program, anyway.

My assignment in the F-16 SPO kind of came full circle because I started out in the Air Force as a maintenance technician myself. I was kind of interested to find out how the other end of the business goes and what we have to do in order to get the equipment in the field. One of the first things that we need in the SPO in order to have a good acquisition is a very good definition of what the equipment has to be. By that, I mean a good functional specification of what it has to do in the training environment. This does not mean I need a design spec. If I have a design spec, I lock in my contractor to doing that design. I would like to give him the function of the device and let him make his device perform that function.

Also, one of the things that we have to watch for is the gold-plating of the system. This is getting nice to have things in there that aren't really needed in the training environment, and I can lay this both on my users and on industry. The users have to be very cautious not to put some of these things in there that they see, these nice-to-have features, these things that look like they might have some application, because that tends to drive the cost of the equipment up and it also drives

the schedule up. And when we get a proposal back from industry, I would like to keep those things out, also, because a lot of times these nice-to-have things that you are working on don't work out when we actually try to get them into the operation.

The biggest problem, though, is dealing with our own acquisition process. I don't have a lot of solutions for that, but I do believe that the DAR acquisition process . . . designed for the training equipment schedule. The training equipment is usually defined very late in the process when we have a requirement that we have to meet in a rather hurried piece of time, and as Claude mentioned, 24 to 36 months is usually not an acceptable delay to get the equipment in the field.

So how can you, as industry, help us? Well, one of the things I think you can do is keep the users in the SPO informed of your product, especially the people that are developing the requirements for these things because if you have a product that was suitable to their application and they have an application that would be suitable to your product, the two of them come together very quickly and we have a good way of trying to speed up the acquisition process.

Another thing is that your training equipment, when it gets down to me -- I have to buy the stuff -- it should be off the shelf. By that I mean that when I'm trying to meet a short schedule to get equipment in the field, I don't have time to do an R&D project. The time that I have would be more just for an applications project, that is taking your piece of equipment that you've already developed and making it fit our application. I don't want to discourage any R&D and I like what I see when I go through all the displays out there, because it shows that everybody is thinking and improving their methods. But it's those applications that are out there, those pieces of equipment that are out there, that should be made to apply to our application, not something new and inventive to do our job.

We need systems that are easy to modify and easy to update. That was presented in several other presentations up here. That also delays our process and keeps our training from being fully effective.

My charge to the using community is that we need to know what you want when you come to the SPO and you need to know who can build it and give us some good specifications so that we can go and take these out to industry. One of the things that you can do to help cut the acquisition process is make a very strong recommendation for desired source. If you want a specific system, you should tell me that. This gives me some tools that I can use to go into the acquisition process and try to get the source that you want. Without any justification from the users, I have a very difficult time trying to justify that kind of procurement.

In the SPO, we tried two ways in the F-16; we bought equipment through the prime contractor and we bought equipment directly ourselves. We found that buying it directly ourselves cut the schedule considerably and the cost, and that seems to be the best way to go unless you're trying to buy some sort of package that the contractor is presenting. Also, the weapon system contractor is probably the one best suited to do hardware . . . trainers because he has the hardware right there. But there's a contracting problem in trying to buy equipment directly out of the SPO, and that is how do you keep everything hooked up together so that the configuration can be maintained properly and there's a free interchange of information. I think that's a do-able problem and it's something we need to address in future contracts.

As Claude mentioned, one of the first places that they go when they start running short of money is to the training equipment budget and there's something to be said for putting up a fence around that money and saving it. I had several fights myself in the SPO to keep the money for various projects that we had going. There was a move underway recently to try and definitize what should be bought. I don't mean to say just that we're going to buy 12 sets of training equipment for the F-16 or the weapon system, but to say specifically what those items are to be in that package. I believe that's a dangerous way to go because what this does is tie your hands if, two years or five years after you get that system in the field, you find that there's something out there that will do the job better, but now you can't buy it unless you go all the way back to the Air Staff and justify the change in your direction.

But who should decide those kinds of changes? It's not up to the SPO, really, to arbitrate that kind of decision-making process. If the user wants a change before it comes to the SPO, that should be fully coordinated with the Staff above and the Systems Command Staff above before it comes down to us.

In conclusion, I'd like to say that we in the SPOs need a firm functional requirement that we can use to send out to our contractors and we all need to find ways to perk up the acquisition cycle so that it's more suitable to the training equipment environment. Thank you.

<u>BGEN Hickey</u>

Thank you, Randy.

Let me see if I can draw all this stuff together. Depending upon whether you're basically pessimistic or optimistic, we could have ruined your day because essentially all we've talked about are the things that aren't working right and the things that need to be improved and fixed. But I think that's the real productive purpose of this kind of a meeting and a forum. Some of the things

we've talked about that are problems are internal to the Air Force and we acknowledge that fact and we think, in some ways, we're making some gains in fixing those. And in doing that, we're going to ease the job of those of you who are out in industry. Some of the other things that we're dealing with and that we're talking about are mutually-shared responsibilities. While we've keyed primarily on the things that aren't working well, I would reiterate what Claude said -- we have some distinct successes in the acquisition process of training equipment and in the performance and effectiveness of that equipment when we bring it onboard and put it out in the field, and we're very pleased with it. I'm convinced that that's the way the Air Force is going to continue to go.

If I can summarize the major points that we'd want to make, we need to look at the training equipment purchase procedures to cut the time. We need contracts that are consistent from program to program and that include training and training equipment projections and provide training equipment impact statements for system engineering change proposals once those training systems are bought. We need training equipment that meets our needs and not very much more. We really can't afford the frills. And we're finding as we get more experienced in here -- I might digress for a second -- that we don't need, as the Army panel just said, we don't need 100 percent emulation of what is actually going on out there. You'll find in some cases two-dimensional panels, and those kinds of things are extremely effective and they do the job and that's what we're interested in is getting the training done.

We need training equipment that is simple to modify. One of the biggest problems we have is we get a huge mainframe computer with an ungodly amount of software in it, and it takes you 2 years and $50,000 to make a minor change in the program. What happens is that doesn't get done and so it stands in the corner and collects dust. Microprocessing, minicomputers, floppy disks, user friendly systems, keyboards that our instructors know how to use can avoid all of those kinds of things and gives us a whole new realm to work in in putting together usable and adjustable and currency-maintained kinds of training equipment.

Finally, we need training equipment that is supportable across the board logistically, as well as otherwise.

Now, those aren't a simple bunch of challenges and I understand that, but I would guess that there are companies that can help, and some of them can help more than others, and we're going to lean towards the ones that help us the most and work the best with us, to be very truthful, because there is a lot for us to gain mutually. For you in industry in a profit margin and for us in training effectiveness. The bottom line of all of that is improved readiness in the Air Force and that's what we're all about.

We have taken close to an hour and I apologize for how verbose all these turkeys are that are sitting around me. As I understand it, we had 5 to 10 minutes apiece and we've nibbled into a little bit of that and now we'd like to open it up for any questions or comments from the floor.

Question   (Cannot be understood)

BGEN Hickey

I don't want to get myself in the trap of naming successful projects and unsuccessful projects or companies or anything like that, but some of the things that we don't need on that kind of a trainer -- we can use flat panels and we can use pictures of panels and we can use stylized drawings. As long as it replicates a function, rather than all of the things that are associated with that particular system in the aircraft and it does the training job, that's really all we're interested in. And I admit that we are the biggest problems in the world in the training community because when we didn't know what we needed or how much simulation clarity and fidelity that we needed, the easiest thing to do was to go for 100 percent. That covers you all the way around. But it's inordinately expensive, it is not necessary in a lot of cases, and bluntly, in some cases we mutually have to take the risk that we can simplify it and it will still be effective. We have some data to go on where that works. But for me to give you specific examples, I'd start getting into hardware and pieces and I don't need that, but that's what we're talking about. We don't need 3-D, all the replicated dials, we don't need all the black boxes that are necessarily replicated in the aircraft nose and the avionics system to do the kinds of basic troubleshooting skills that we need.

Mr. Laughlin

I might add to that, General. In some of our programs early on, because our requirement is to teach the system job guides and . . . isolation manuals in the maintenance training environment, of course we're going to try and follow those tech order procedures that are in there. Early on, we thought there was only one way to go and that was to have a fully-proceduralized type trainer with a lot of instructional features and a lot of cueing and somebody tapping a guy on the shoulder at the machine and saying, "hey, you goofed," and this type of thing. We have gone a long ways and we have determined that basically, we really don't need procedural type trainers to teach maintenance procedures and we can eliminate an awful lot of software modeling and a lot of other things if we can get down and just have that trainer respond the same way that the aircraft or the missile system and its test equipment respond and not have a lot of extra material in there that we may never use in 10 years of instruction.

Major Evans

There was one particular application I had in mind. It's not in any of our equipment today that we have on the F-16, but it's video disks. When video disk first came out, everybody was saying, "hey, let's replace all the slide projectors with video disk machines." Well, that was just what they were doing -- putting in 52,000 slide projectors rather than the 140 slide projectors. Now I'm starting to see some more applications of video disks, so at the time, video disk was kind of a gold-plated application. It wasn't anything that was going to be usable moreso than a slide projector.

SMSGT Kox

To parrot a little bit of what Claude just said, it's not fair to say that some instructional features aren't required; however, I think within our command we consider our instructor to be the best instructional feature we have and we'd rather employ him.

Question

. . . . . It's been my observation that early in the acquisition program, there's always a constant change of players and there's a lot of time lost and effort delayed because of the change of players. This is not a reference to Sergeant Kox because I think that was a definite improvement, but I do want to comment because it has been brought up that there's a lot of re-education in the critical early stages of acquisition where problems are not resolved or followed through because of a constant stream of blue suiters. I have no magic solution and I don't think anyone else does, but I do want to bring this up as a comment.

BGEN Hickey

Okay, that's fairly stated. We're trying something new in the B-1 program in that for the first time, we have a resident trainer, a tech training expert from the 3306th, assigned to the B-1 SPO, and as far as I'm concerned, he's there for the duration. So from a training equipment point of view, we are looking to see that, even though there's only a single representative within a large organization like that, we will have a resident, constant thread, somebody who can remember the audit trail that's going down through there. I don't know how successful it's going to be. I have high hopes for it and so far, it's working pretty well, but it's very early in the program. That's one way that we might be able to do that, but you're talking about through the contracting agencies, through the various and sundry members of the SPO itself as they come and go, and then the people in my organization. We try and cover part of that by having folks like Claude Laughlin around who aren't quite so prone to move and bounce around the countryside. Again, that's a balance, but it's a point well taken.

Mr. Laughlin

Another thing that we're doing on some of our other programs is we're assigning our instructors, our subject matter experts, as the program gets started, to work in the development of the functional statement of needs for the trainers and development of the training program, and trying to assign those folks and hold on to them through the trainer acquisition process and then in turn, they will be the first instructors on that system. I think this might help the program a great deal if we can get that continuity from our side of the house.

BGEN Hickey

And that's probably the most beneficial, at least to us internally in the Air Force, is that the folks who are ultimately going to use it have a continuing interplay with it and bring it on line and have an influence on it.

Major Godfrey

I'd like to disagree with the gentleman in the audience. From the SPO's perspective, the constant stream of players does affect the acquisition. I was in NAF-16 SPO from 1978 until this year and there were a couple of training systems that had several different SMEs involved, and as a result, we had difficulty in getting those things in the field in a condition that they were acceptable to the people out there. One of the successes that we just recently had in our training equipment acquisition was due to the fact that we had a stabilized group of SMEs, subject matter experts, from our training command that helped us put the thing together. If that hadn't been that way, I don't think it would have been the success that it is. But you come up against the Air Force assignment system. One of the reasons I'm not in the F-16 SPO anymore is because I served my time there and, as the Colonel said, I guess I reached my level of confidence because they moved me to another job.

Question

I'd like to just ask if, looking to the future and not to the past, and these programmable maintenance trainers, which you seem to think is the way to go, if you have anything that you could give to us with regard to the policy for software and courseware maintenance. Are you looking towards more organic ATC maintenance? More contractor maintenance? Or are you looking at it on a case-by-case basis to eliminate some of the problems that were referred to where you may have 24 months delays in introducing new software to correspond to later versions of TOs, etc.?

BGEN Hickey

I think there are about three questions buried in all of that. We would hope, over time, to put the software into common language so that even if we have different contractors providing different pieces of the training equipment, we'd have an interface there, a common network. I will allow the other panel members to jump on me if they don't share my view, but I think that we tend normally within the Air Force to want to do our own maintenance and to maintain the equipment once we've procured it. Interim contractor support to get it going, but eventually we would like to be able to maintain it ourselves -- to some extent because of where it is that we might have that. And I think there was one other point that you wanted to make and I've forgotten that in trying to answer the first two.

Mr. Laughlin

I think one of his other points was, we are certainly looking for some improvement in the capability for the instructor to change the software at the training site. If there's a new procedure that comes out in the maintenance guide that he's following, we would certainly like to see that we could get to a point where that instructor can change his program the day he gets the change in the tech order and not have to sit around for 18 or 20 or 30 months waiting for that change to be made in his software and continue to teach from an outdated tech order.

Colonel Shanahan

Historically, in the tech training business we've had problems a lot in the past with systems that come on-line, especially something like a computer assisted instruction, where the instructor was not involved at the beginning in designing the thing, he was not trained properly in how to use the system, and what really happened was he felt that he became sort of a baby sitter to a learning center, you might say, and was turned off by the system. When the people who are supposed to be making it work lose interest in the system, the system has a tendency to go down hill real fast. So the systems that have worked are those the instructor was very involved in the initial stages of making the system come onboard, was trained properly in how to use the system and how it integrated in the job he does. An example we had at Chanute is that we spent a lot of money on doing full-length films on how to do various things and some of our people came up with a film clip system which was basically a zeroing in, zooming in photo of the intricacies of a device. The film would then stop, the instructor could talk about that in detail, and go on to the next segment of that procedure, whether it was safety wiring or soldering or whatever. That was much more effective than just sitting there monitoring or becoming a projectionist for a film. And it was

much more cost effective. So we find that when you get the instructor involved, and he can see how the system really improves training, it works a lot better.

Question

I would like to make an observation here. As I listen to the problems, I observe that those tend to be breakdowns in the system as opposed to technical problems and so forth, and over the years I have noted that the Air Force acquisition and logistic support system is an awesome and wonderful thing when it works, but when it doesn't work, it's just an absolute disaster and the problems that you guys have faced -- and I know about some of them in some detail -- where the system has broken down. That's nothing new, I don't think, so then I say, well, what is the solution, what can I offer? Well, let me say one thing at least, and that is that I've been in several instances where I've heard the ATC, the poor guy at the bottom of the pole, be told, "don't you worry about the acquisition and whatever else because that's our job." My attitude is that the people who do have that job are primarily motivated by acquiring the weapon system and until the ATC gets into the middle of that system at the early stages and makes sure that that system works -- not necessarily carrying it out, but making sure that it works -- and if it's not working, then call a halt to the whole thing until it does work, then you will continue to have these problems.

BGEN Hickey

I couldn't agree more, and we're trying to do that. Because of our organization, as you might imagine, the way to get that done right now though is by having the most obnoxious personality in the world and we're trying to espouse that. We have a friendly face that we present to the world of our users out there in the . . . and we don't want to be just purely antagonists to the folks in the SPOs, but we're getting to know those folks awful well and talk with them a lot and where we can influence their decision-making process, we're working the devil out of that. Unfortunately, that's a matter of personalities and people who happen to be in the specific positions at the time and I guess what I'd really like to do is have a way of bureaucratizing that or institutionalizing that so it happens, but it won't. We have good success with some SPOs and, again, it happens to be what kind of a personality match we have and how well we work together and how we corporately view what our mutual tasks are. I see the same thing in industry. I can tell you that within one individual company, we have the full spectrum of success and failure under the same corporate logo, and again, it's a matter, I think, of personalities and individual talents, management talents, within those little pockets where we're dealing. That's what makes it fun being in this business.

Question

Many of the problems that have been discussed here concerning training equipment have been demonstrated to be solvable by using the interactive video disk system for a low fidelity, low cost simulator. Is there any plan by ATC to develop that kind of a system? Fort Gordon, the Army, has been using it for about 3 years very effectively and I was just wondering if ATC was going to get into that.

Colonel Shanahan

I think we're going to investigate that aspect of training equipment. I've got another guy over here who is working on what we call AIDS, our advanced instructional development or delivery and evaluation system, and I would defer to Colonel Baker on that particular subject, if I might.

Colonel Baker

I work the training research side of the house and work for the human resources laboratory, and we have, internal to the Command, a well developed structure developed over the past several years to look at the questions of how does the instructor fit in under non-conventional instruction, his new role, using equipment that really puts the focus on the student rather than on the instructor. It uses interactive video disks and other types of new technologies that allow him to train to a task in the quickest way possible. We're also taking a look at some research which will say which kinds of instructional tasks are most suited to the new technologies, such as computer assisted instruction because we see a lot of the new technology not as a replacement for the instructor but as just another training media. The question is, how do you integrate that into the systems that we already have to allow the people who we already have and the existing equipment which we have to come together and not be a disjointed mass. The questions of software, standardized software, which is another research project being worked, in my opinion, will lead to a modular format. The question of how well can you maintain and update and modify a training device which has software, you have to use a higher order language with a modular format, the PASCAL and the ADA and some of the others of the standardized languages going towards the ADA language, which still isn't here, but in the future you're going to have to look for that. There's no doubt that with all the embedded computer systems in the hardware, the actual operating hardware, that there will be more and more and more computer driven systems in the training devices. The question becomes one of not only fidelity of the equipment but how do you integrate that new technology, methodology, into the existing instructor-centered environment. It's not just an Air Force problem, it's an Army and a Navy problem, as well. So I think the IR&D that you're doing to look at what I have heard our user needs are, something that's simple to maintain, that doesn't take a whole

other school just to learn how to operate the device and maintain
it, something that is simple, yet inside can be very complex --
simple for the student to operate and to the instructor and where
the focus is on the skill to be developed and not on the operation
of the device. Those are the kinds of things that really use
technology in the guts of the device and yet, in the instructor
and the student interaction, it should be simple to maintain,
simple to operate, simple to modify and update. That is, to me,
the technical challenge rather than the use of a particular in-
teractive video disk, although I see that coming.

Now, the advanced instructional delivery and evaluation sys-
tem is a proposal that the Air Force originated within Air Train-
ing Command and some of the other Commands have come on-line in
supporting the statement of need. And it is for, if you will, a
Training Command-wide and possibly Air Force-wide look at new
ways of doing business with new training systems. It is still in
the early definition stages. There will be announcements later
on that you should be looking for in the Commerce Business Daily
and so on, but it's an attempt to get at what you're getting at
in a coherent, systematic approach, rather than a piecemeal ap-
proach. Rather than taking one piece of technology here, inter-
active video disks, and saying how can it apply, let's take a
look at the system and the available technologies and the exist-
ing structures that you have and how can you integrate it in in
a systematic approach. That's what this AIDS project is all
about and it can be very easily overtaken by events of "hit
quick" on this particular device, this particular technology,
this particular problem. In the short term, that's probably
good; in the long term, it's not as effective and I think there
will be, with standardized software, with modular software, in
a common language, you're going to have greater consistency on
the types of instructional delivery devices you're going to have.
The hardware and the formatting, as I would see it in the future
from my perspective, could be vendor-specific, but the . . .
languages and the programming support is going to have to be a
little bit more standardized to really achieve the training effect,
because our instructors do move around. Any time you're tied to
one particular equipment and you move somewhere else, you've got
to learn it all over again. So I see standardized software as a
way of the future.

One other aspect on that -- the Air Force Human Resources
Laboratory does all the Air Force research. They, in conjunction
with the Navy Personnel Research and Development Command and the
Army Research Institute, have what they call a Tri-Service Com-
puter Based Instruction effort. The Army is working the video
disk side of the house because they are further along than we are
and there's no need to duplicate it. The Navy is working the
maintenance simulator side of the house and the Air Force, the
standardized software. There is a concerted effort to bring all
that together in a systematic, coherent way without repeating what

the Army's doing. The laboratories in the Services are working together on that.

Colonel Shanahan

I'd like to comment about when that equipment actually gets to the schoolhouse. What I'm really looking at is will that piece of gear, whether it is video disk or whatever, improve knowledge in that area or block of training and will it shorten the time involved, because time is money to me. Now, you have to remember that we have to lock in; we cannot change that final product. What I'm saying is, what the needs of the operational commands are, we have to lock that in. We should not have a system like I've seen in some areas that we've eliminated where we ended up testing for testing's sake. What I'm saying is, we shouldn't have a system that tests or uses a computer on how to maintain a jet engine. When the jet engine goes down the flight line, we don't run up with a piece of paper and say, "take a test on how to fix a jet engine." We actually have to fix the jet engine. But if you have a system out there, whether it's video disk or something else, that shortens the time and gives me a greater retention of knowledge in the student, we're really looking for that because we have this strange problem that goes on which is we train to a certain level; at certain blocks in a long course a student may take 30 days leave or vacation, as you may call it, before he gets to the field, he takes a few weeks to orient himself into the flight line, he walks out in the job and the supervisor says, "I want you to do this little job that you were taught six months ago in the early parts of that course," and sometimes the student says he doesn't even remember having that. So we have that problem we're always fighting, to make sure that the student arrives on the flight line or in that job site with the knowledge he's supposed to have, not just that six months ago he was tested on that and passed the test.

Question

That's precisely why I asked the question, because indications are, from the Massachusetts Institute of Technology to the University of Nebraska, preliminary studies at Fort Gordon conducted by Doctor Ketner, that the answer to all of those specific questions you have is generally yes. Retention is higher, the training is as effective or more effective than on the actual equipment because of all the advantages that develop, and being in ATC myself, I was very curious as to why we were not on that bandwagon and I just thought I would ask specifically.

Colonel Shanahan

From my point of view, at least, I think one of the reasons that slowed that down a little bit is some of the problems of the past where sometimes the systems have taken over learning. Computer managed instruction has managed the student right through

the course and out into the field with very poor training, these kinds of things.

Comment

Right. That's bureaucratic inertia and I certainly don't think we should operate our training system on what was done in the past. We should be looking at what's going on in the future.

BGEN Hickey

Said another way -- let me take a whack at that -- we've had other promises like laser video disks and great outputs and great estimations from institutions of higher learning and everything else that we have now discovered the panacea to all of our training and educational problems, and we found out that some of them weren't worth a damn. So I would differ with the answer that Colonel Baker gave you. He said while the answer basically to your question of are we going to do that on a broad scale is yes, I would tell you that probably the answer is no, because I have not seen anything yet that convinces me that there's any single system out there, whether it's interactive video disks or otherwise, that has broad application across the board. We have too wide a spectrum of the kinds of training that we do for that to be applicable.

Comment

I didn't mean to suggest that it is the panacea to and the answer to all of those problems out there, but it does solve a lot of the problems that we've had with training simulators in the past. It's a lot cheaper, lower fidelity, of course, but you can certainly get a lot done on them.

BGEN Hickey

Absolutely, and to that extent we hope to use them. I think that's probably, from my personal point of view, the biggest decision-making process and the most worrisome problem that I have is trying to, from the fairly broad spectrum of training tools that are available to us, picking those which are appropriate for the task to be trained. And again, I get into that nebulous area of what's gold-plating and what isn't. There are places where we don't need a 52,000 frame-per-side video disk or an interactive system and you can get along with a little cardboard circular thing that holds about 25 negatives and let them roll around there. Even simpler and more disposable and easier to change than slides in one of these carousels. And at least as long as I'm involved in the business, we're going to take them one at a time, we're going to try and do a systematized approach to the overall training system, but we're not buying in on any blanket projects. I may get thrown out of my job and somebody else would do that, but I'll tell you where I'm coming from right now.

Question

. . . . . of trying to lower the fidelity and reduce some of the cost, I think some attention should be placed on trying to shift some of the responsibility back to the student's own mental equipment. By that I mean, give him enough information so he can learn how to think logically and work with the equipment you have. One of the things that you have in an advantage with college education is the ability to think in abstraction and abstraction is definitely a lot cheaper than the real thing. I don't know if enough attention has been paid to trying to teach the logic of working with high technology.

BGEN Hickey

I could go through the hazards of taking a shot at the public school system, but I don't think I will. What I would say, opposite of that, is that if we have a problem in terms of getting people used to working independently with computer terminals and things like that, it is with the old duds that have grey hair like myself and not with the new young folks that are coming onboard. In terms of working that whole process, though, of getting a better logic flow and putting more of an onus on the students themselves for their capabilities, we could probably do that to some extent in today's current, fairly rich recruiting environment where we're getting very high quality young people coming onboard with high mental aptitudes. As a pure matter of what I suspect that will happen to both the economy and to our pay and to the general demography which says that there are going to be some 15 to 20 percent reduction in eligible people that turn 18 every year for all of the Services and industry to compete for over the next 4 or 5 or 10 years, we're going to end up with a lower mental category of persons to meet some of our recruiting needs. So, while I agree with you, the more you can use the computer between that person's ears, the less you have to computerize the machine that he's sitting in front of, I don't think that we're going to have a great deal of success in getting that basic mental talent across the board. We're going to have to be able to deal with a lower mental category and be able to bring that up to some training level. I'm probably begging the issue. I have not thought of a way to establish within the Services some kind of a special course or training system which would, in fact, take a mental category 3 or 3B or something like that and move them up to a 2 in terms of mental capability.

Comment

Sir, that could probably be done with interactive video.

Question

General, I'm from Headquarters AFCC and I'm sure you're well aware of the problems we're having with the GPN-22. Now, we're

seriously pursuing the purchase of interactive simulators and the development of a video disk. We've touched base with Air Training Command, asked them to come onboard with us. Have you heard anything about the program or are you in support of the program the way we set it up right now?

BGEN Hickey

I'm going to have to waffle my answer on that. I basically support Air Force Communications Command if they see the need for a Command-unique training system that they want to spend their money on to do that. But I am generally not in the business of procuring training equipment for other major Commands within the Service. It can be done, but if it's uniquely for your Command, it's kind of like some of the OJT processes that you use. You bring up an interesting point, though, and it's not unique to the GPN-22, but I find -- more times than I'd like to reiterate -- that shortfalls in basic equipment design and basic concept of operations and in logistic support all tend to become training problems and the way we solve those is to extend the training time and to overcome what the byte system doesn't do by giving our technologists or our technical folks a much, much broader capability to do fault isolation and do that kind of work within systems. It's frustrating to me. It has to be done one way or another, but there are some other basic conceptual faults with the whole GPN-22 that I think are at the seat of its problem. I've got two problems -- one with the GPN-22 and the problems that it has; the other one is with the process of procuring and running training equipment. The general philosophy that I think we maintain in Air Training Command is that if it's generic, if it has a broad base of support, if it's an Air Force-wide, if it has generally Air Force-wide application by a broad spectrum of a given AFSC population, then we ought to do it and we ought to do it in a central schoolhouse, because that's the most efficient way to get that basic generic training done. If it's weapons specific or systems specific, if it's unique to a Command or if it's unique to a small portion of a career field, then it either needs to be done in that Command unique training system or even in an OJT environment.

Question

. . . . . . Training Development Branch we have down at Keesler and also members of the 3395th, as well as the 3300th, and invited them to get together with us and attend a preliminary training conference as to the pros and cons of how we'd attack the approach on developing a complete video disk program on the GPN-24, which would include the 12 and the 20. Up to this point, we seem to get some real good responses out of Air Training Command, but one of the areas that seems to be deficient is that the people at the top are not always aware as to what's going on down at the bottom.

BGEN Hickey

Well, I would guess that that's probably a fair indictment that handles most bureaucratic structures and we're probably not immune to that. I'd like to pride myself that I know everything that's going on, but by the very nature of the beast that I'm sitting on top of, I don't and I'd be the very first to admit it.

Question

Doctor Katner over at Fort Gordon has invited the Commander of AFCC and I think that there was a memo that was going out, also, requesting ATC to come over and take a look at their capabilities -- kind of a get-interested type of situation, and I was wondering if maybe you had heard anything on that.

BGEN Hickey

No, I have not, but we are interested. A good number of the folks here have -- I think we're doing a fairly decent job keeping abreast of what industry has to offer and certainly are spending a lot of TDY money going to various and sundry places to do that. Unless we're all going with blinders on, we're not getting very much out of it. I don't have a Keesler representative here right now, but I think we're involved in that process. I guess probably one of my concerns is that we keep AFCC out of trouble in the whole process. Go ahead and do it. We'll be glad to give you technical advice and technical help, so what you end up with is what you really need.

Colonel Shanahan

I'd like to comment for your interest, I send training evaluators from the Tech Training Center out to the field and they talk to the graduates about six months after they graduate to see how they're doing, see what problems they have, and there is a fallout. As you remember, a few years ago, back in the middle 70s, we had a lot of . . . , a lot of people got out of the Service, a lot of people did not remain in the Service. We're finding today that we have an awful big problem in middle management. We have lower quality of middle management, which hurts our on-the-job training program. It's forcing us in the tech schools to do a lot better -- more performance, more hands-on, more trouble-shooting type of training -- to recover from this area of the less ability of our OJT supervisors in the field. The question that you had a little while ago, if you can figure out a way that you can convince the school systems in the United States to turn out an 11th grade reading grade level out of a high school graduate and train people in general mechanical aptitude, when they get to my school I can do a heck of a lot better for the system.

Question

For the Colonel who is in charge of the training evaluation, I just wondered -- there is a study I believe . . . and AFHRL were participating in to evaluate the F-16, F-15, and E-3A maintenance trainers. Is there any data available from the study? I hear a general responsiveness to maintenance training simulators is the way to go. Have you got data that is either already available or shortly to be announced that is based on that particular DOD-sponsored . . . .

Colonel Shanahan

The answer to your question, is there definitive data available yet, no. The only simulators of those three that are in the field are the F-16. The F-15s will come in next April, E-3A maintenance trainer may initially be delivered in February, and so they're not even there yet. My basis for optimism in the SAMT program, or the simulated aircraft maintenance training program, is just purely on my tours through the bases where we have that gear and that equipment, particularly the latest model that we have ongoing, which is the set that's at . . . AFC and I was over and visited Germany in the last of September and I would only tell you that they used that set of equipment going through a full conversion from the F-4s to the F-16s, and if I have a worry about that whole training environment over there, it is that they have been able to do so much training with the mobile training sets that they have probably spoiled the DCM and the Wing Commander that's there because they haven't made hardly any demands on the flight line. We're now going to go into a conversion process at another base and we're going to ship that training equipment out of there. It's going to be a great come-down for that Wing when they find out that they've got to start supplying hardware and equipment off the flight line to support their training load, which has been essentially load-free so far. They've done a super job. I couldn't be more pleased with it. But I don't have any definitive data yet. It will be a while, because we haven't even fielded some of those equipments they're going to look at. Very much interested in that study and very familiar with it and tracking it.

Question

Could you address the training requirements or needs or the approach for doing things in the NBC environment? Nuclear, biological, and chemical?

Colonel Shanahan

I can approach it from this point. We have a very limited formal training process within the United States Air Force. It essentially is out of our Disaster Preparedness School at Lowrey.

From that point on, we teach their officers and enlisted person-
nel going through Disaster Preparedness training and have that
responsibility, and then they go to the individual bases and wings
and then within those environments, the operational environments,
they conduct the training program there. The primary agent, or
executive agent, within DOD for NBC training at the present time
is still the United States Army in terms of gear, what kinds of
protective equipment, what kinds of sensory alarm systems and
things like that you have. There's an awful lot of work going and
I would be the first to tell you that we in the United States are
very, very far behind where we should be, just in terms of defen-
sive protective gear and our ability to operate in that kind of
an environment. Our training system is not there, but I think
we're in kind of the same trap that happens in other places. We
don't have an operational and a maintenance concept yet upon which
to build a training concept or a training plan.

Major Evans

To answer your question from a field training standpoint,
there is a very limited amount of training actually being conduc-
ted in some of the aircraft battle damage repair courses, where
they actually do don the NBC suits and perform the aircraft battle
damage repairs using the mask and the chemical suit and working
under field conditions in a simulated NBC environment.

Colonel Shanahan

And I also need to say within . . . in terms of exercise train-
ing of actual technicians doing their weapons loading jobs and
aircraft servicing and those types of things on the job, they are
practicing and training all the time. But I was keying more to
a formalized training course in one of the resident schools and
there it's minimal, minimal.

BGEN Hickey

I think we may have blown right through our 11:40 quitting
time. I appreciate your attention, your involvement, and the
questions and points that you raised today, and I hope that what
we had to say was worthwhile to you. Thank you all very much.

SESSION IVB

SOFTWARE DOCUMENTATION STANDARDIZATION PANEL

Mr. William D. Turner

As you can see from your program, my topic is "Management Over-
view," probably one of the most dangerous topics there is. I'm
going to deviate from that because really it's an introduction
to an introduction of the panel. We felt it would be worthwhile
perhaps, to make some points really stemming from last year's con-
ference and how they have evolved into the arena that we have set
up this morning.

For a lot of you, particularly the old timers in the audience,
I think you remember back to previous sessions -- the NTEC con-
ference -- where the struggle of the moment was hardware. We used
to have meetings like this and talk about configuration control of
hardware, standardization, quality control, and all the rest of
those fine terms. Fortunately, we've either beaten the hardware
problem into submission or we now have a newer problem that is a
higher priority one, so we're moving onto the subject of software
and we now have a software struggle on our hands.

I think we're all experiencing and have experienced the tre-
mendous impact of this technology, an exploding technology and
one that is just practically impossible to stay right up to date
with.   We have experienced and seen a growing evolution of dis-
ciplines, structures, organizations, definitions, difference in
perceived requirements from customers as well as internally with-
in industry, and significant communication problems. It was
funny this morning, in sitting in the sessions, I began to feel
that I was in college undergoing a class in psychology because
the terms were used "parents" and "siblings" to reference modules
and windows, and I got so confused I thought maybe I was in the
wrong session. But we really are in software documentation here
this morning, which focuses on the issue that we're talking about
and that is software process, as we all know, is documentation
driven, which, of course, is the bane of all engineering talent,
ergo, the problem that we're wrestling with.

A year ago at the so-called executive working group session,
which takes place prior to the official opening of the conference,
software problems were very high on the hit list of problems be-
tween the mutual managements. As a result of that meeting, the
challenge was laid on and taken by a group of people from industry
to see what we could do to form working groups to attack the prob-
lem on a joint base -- industry and government. Fortunately, we
already had an organization well underway under the auspices of
NTEC and NSIA in a computer working group that was set up there
and it was well in process looking at various aspects of software

and hardware associated with the computer explosion. At last year's
session, under the auspices of ADPA, we formed another group, a
smaller operation, and we focused on the term "standardization" as
one of the main goals. I don't want to steal any thunder from
the group here this morning, because I think they really have some
thunder to present. Between the two operations, operating both
in parallel and in consort, I think we'll be presenting to you
some very positive initiatives and actual accomplishments in doing
what we have strived to do and that is, bring about, number one,
a better understanding, communication, and a move toward a standar-
dization of the process so we all know where we're going and what
we're to do.

Really, the main purpose of my introductory remarks is to
hopefully pass on the challenge that was laid down last year to
keep this process that has occurred over the past year going, and
we need a continuing commitment, both from the Government side and
from industry. I think I'm safe to voice the industrial opinion
here that we have committed and plan to continue that commitment
in the ensuing years to keep this initiative going. I think it
will be key that we set up some definitive milestones that fall
out of these working groups, and I think our goal has got to be --
and I hope it will be -- that a year from now in a similar session
we'll be able to report just as significant progress as we've made
over this past year and hopefully even more in getting our hands
around the software struggle. The initiative, I'm sure, will be
looked at and it's my hope that these two parallel efforts will
merge more and more into one cohesive, joint Service/Industry
effort so that we can take maximum advantage of the talent that we
have already put to it.

So again, as introduction, there has been a great deal of prog-
ress made. I'm here to voice the commitment of industry to move
ahead with this initiative. I hope you in the audience, if you
aren't already part of this commitment, will take the commitment
for yourself or back to your respective management to participate
in this activity so to keep the effort going.

With that, I'd like to introduce this morning's panel modera-
tor, Mr. Dave Daniels, Head of Systems Engineering Division here
at NTEC.

Mr. David Daniels

Thank you very much, Bill. I'd like to thank all of you for
attending. We appreciate this kind of participation and hopefully
the kind of support that Bill is talking about will continue.

I'd like to call your attention to the program, if you're
following it. If not, it doesn't matter. I think we'll go
through the list of participants in just a second, but there are
two things -- one, we're not following the order that is indicated
in the book. The speakers won't be in the same order as listed.

And second, we have one change which I'll talk about in just a second. Before I talk to you about the general interaction between the audience and the panel, I'd like to just introduce the panel members and tell you just a little bit about them. Then I'll say a word or two and we'll get on with this.

On my far right is Mr. Bob Layne of Hughes Aircraft Support Systems. He's the gentleman that's been chairing our joint NSIA/NTEC working group looking into a variety of computer-related issues and he'll give you a status report about that in a bit and some projections and some of his own thoughts about where we might need to go.

The next gentleman on his immediate left is Mr. Walt Discenza a Manager of Software Engineering over at GE Daytona. He's filling in for Dr. Wei Chen, who is out of the country on business and wasn't able to be with us. Walt is really one of the primary workers in the ADPA and NTEC and Air Force working group that had been looking at some of the data item descriptions and trying to come up with things that are universally applicable and more effective to help us get the job done and get on with some consistency of procedure and documentation.

The lady on my right is Ms. Karen Bausman of ASD SIMSPO. She's a Computer Resources Systems Engineer there and she'll give us a few words about the Air Force perspective and how they see the standardization issue taking place.

On my immediate left is Mr. Brian Goldiez, a member of the Systems Engineering Management Branch at PM TRADE. He'll give us the PM TRADE viewpoint.

Next on the left is Frank Jamison. He's with NTEC. He's the Branch Head of our Software Engineering Branch and he's been working with almost all of these folks on a continuing basis for the past year. He'll give you a little bit about our perspective of things.

On the far left is Mr. William Egan from MAT 08Y, who is responsible for the update of MIL-STD 1679 and also for the Navy review of the new MIL-STD-SDS effort that's in progress, and he'll be able to tell us a little bit about how he sees the overall standardization issue going and what impact that might have on us here at the Center and throughout DOD.

I'd just like to say a word or two. What we plan to do is have each of the panel members give you a report about those standardization efforts that they have been involved with the past few months, in particular, and where they see those things going. Then, after each of them has had a chance to give you their report, we will invite questions from the audience and I'd also like to invite you to provide your own suggestions -- not

just questions, but tell us where we might head, things that are of
concern to you, and I'd like to tell you right now that if there's
anything that you'd like to make sure is considered in our standar-
dization efforts in the future, if you would jot those down on a
piece of paper and see that I get them, I won't guarantee that we'll
respond to you personally because we could get more than we could
handle effectively, but we will take them under advisement and at
least you'll know that it got in the hopper.

With that, I would like to say a couple of things as a matter
of lead-in. I think you're all familiar with the general scenario
of computer systems and related software over the past few years.
Just to summarize very briefly, there was a significant growth in
computer capabilities, expanded software systems, and, of course,
increased complexities. There was a highly publicized software
impact on system cost, delivery schedule, and supportability.
You've heard of all of those things. This led to some diverse
efforts to improve the software development management and the
related documentation, and I think you're all aware of several of
those, one of them 1679, 1644, and others. This diversity was and
still is a problem. I think you can all readily appreciate where
an industrial firm would be and the problems they face when they're
trying to respond to multiple DOD customers, each with a different
management methodology and a different set of documentation re-
quirements and the level of detail and the whole nine yards. It's
time consuming, it's people-resource consuming, and it's costly,
both to the contractor and the American tax payer and I don't
think any of us feel that that's the way things should be. I
think a need for standardization has been recognized. There are
some pros and cons about that. There are several groups working
right now towards standardization and you might think with all
of these people, various groups, working on standardization that
you might wind up with anything but standardization. You'd think
that one group might develop their own attitudes and then try to
impose them on everybody else and what you'd wind up with was a
sort of a multi-sided problem. That points toward the need for
one thing -- that's open communication.

Another thing that we need to recognize is that if standardi-
zation is going to be effective, you have to have a general, in
some sense of the word, because it's got to cover a lot of people
and you have to let them do business their way, and if the nature
of their software systems is different, there might be something
that needs to be addressed differently. So in a sense, you have
to have some generality, but if you go too far with it, then
everybody has to have his own implementing instruction or direc-
tive or procedures, and then you're right back where you started,
with maybe everybody running off doing things differently and you
don't really have standardization but just one standard document
over the top. We really don't want to get that sort of thing
because that doesn't buy us anything. What we really think we
need -- and I think both of those issues point to the fact -- we
need open communication. All of the people on this panel for the

past year have been working toward one goal and that is to establish
the most effective, and hopefully uniform management methodology and
associated documentation that they could possibly come up with.
We've got to keep that going. We're not there. I think you'll find
today that among the panel members, we haven't reached 100 percent
agreement on everything -- maybe not on an awful lot of things.
But one thing we have agreed on and that's to continue this dialogue
and keep working together. It's been a real pleasure to get the
kind of assistance that we have had out of the industrial side of
the house.

With that, I'd like to introduce our first speaker again and
then we'll just go through these things in order, and again at the
end we'll invite questions. Without further ado, I'll introduce
our first speaker, Mr. Bob Layne.

Mr. Robert W. Layne

The NTEC/NSIA computer working group, as you will note from the
other activities that will be described to follow my description to
you of what we're doing, find ourselves somewhat in the similar
place to the gentleman who, while in warm embrace with a young lady,
suddenly heard a clatter outside and she said, "Oh, my - my husband
is home. You have to get out of here." Said he, "Where's your
back door?" Said she, "We don't have one." He replied, "Where
would you like one?" Now, we came to it early on that we weren't
going to be able to walk on water or do things like that, but we
felt we might every so often just have to go through a wall on the
run.

Let me step back and give you a little description of where in
NSIA the group that generated the industry side of the working
group comes from. For your interest, this is the same subcommittee
as that one that has the little -- the off-color box, Trainers and
Simulators Subcommittee, is the source of the industry side of the
computer working group and it's also the source of the committee
that is putting on the conference that we hope you are enjoying
while you're here with us in Florida.

And now a little bit about how this all started. During the
1980 Interservice/Industry Training Equipment Conference in Salt
Lake City, there were some discussions. Believe me, they were
casual in nature -- that doesn't mean that the subject wasn't heavy
because it is -- but it was that we've got a situation here where
documentation of software is needed, it's getting away from us --
and I've got a little bit more to say on that when I get to the
next slide. But we need some kind of an interchange of information
between the Center and industry so that as we approach documenta-
tion, we don't, if you will, over-react to it. Many times we know
that a need is in existence for a long time. When it's suddenly
recognized, it's as if the roof fell in and then again, we need
to go through those walls on the run. There was an exchange of
correspondence because there was some need to formalize this; to

have specific industry, meaning specific company or companies involved, is not the way the Services can operate. But obviously they can operate through an industry association. But even with an industry association, it is necessary that there be some reason, particularly in the case of NSIA, where their charter is laid out, they must have a reason to react to something. So NTEC Technical Director, then Dr. Harvey, wrote a letter to General Robinson -- he is a retired general, but he is the President of NSIA, requesting assistance, indicating the need and describing the concepts of having a group which -- and you'll note I slipped to the little thing I have on the slide -- the key phrase was a "sounding board." Some people say that's something to pound on, but still a sounding board. General Robinson very happily wrote back, indicating that NSIA would step forward and be very glad to participate in this activity.

Informing the group, and I'll have to use the personal pronoun here because I took on the activity, I decided early on that we would want to first get people that were dealing with the Center, since it was the Center that had the incentive to come forward and say they'd like to have a group participating with them, so obviously we were going to select companies that were involved in heavy business with the Center. And also, to keep the group within manageable size, I selected six companies. You see them listed up there. Mr. Hank Okraski, who is now the Director of Engineering -- for a while he was the Acting Director -- took on the task of being the Chairman for the NTEC side of the activity. Dave Daniels, our moderator today, and Frank Jamison, who is on the panel, were designated as active members.

Unless you are not even associated with software, you might realize that what I was running into as I tried to form the committee -- granted everybody knows you need to write things down somewhere; just within our companies we like to keep track of things -- it became obvious early on that there was still some question in the realm of why all this documentation to begin with. Well, we in industry tend to have been the authors of the situation of a need for software documentation. By permitting computer software to become such a black art, we fomented a situation where somehow the frustrated and confused military customer needed a way to be able to sort it out after we handed it to him and maybe went on to other pursuits, for whatever reason -- maybe that's the way the contract was written.

Documentation of computer software is with us to stay. This was my standard answer to anybody that was a little recalcitrant in joining up. By the way, once the thing was underway, there was no problem in getting active and good people. And just for your consideration, they're scattered throughout the audience and if you ask us any questions we can't answer, you're in deep trouble. They might be right in back of you. So the idea was, let's work together and establish reasonable requirements for the process. If we're going to have documentation, let's make it something that we all can tolerate.

October 15th was our first meeting with NTEC and was at NTEC.
The key issues, obviously -- MIL-STD 1644 was the topic of the
day. We'd get to the DIDs when they were ready. The undercurrent
of all of this right at that time, early on as we tend to say, it
was noticed that there ought to be some way to cause this to be an
interservice specification. As Bill Turner pointed out, that did
become an issue at the pre-conference meeting in 1981.

Since it's a computer working group, we don't only deal with
the software documentation issue, and while that is our stress
today, I thought it would be good to share with you some of the
other activities which we are examining. Some of these, we have
come up with some answers. Again, as I say, we are not formed on
the basis that we think we're going to solve all the problems all
of the time every way, but we are going to attack some of them
and see to it that there is a continuous and reasonable line of
communication.

Again at this time, the first meeting, it was noted that there
needs to be some tie-in, some way to bring hardware and software
documentation together. We've actually kind of set the hardware
considerations aside, but believe me, they are ever present in our
minds.

Another issue was how we can minimize or eliminate the neces-
sity of all that off-the-shelf hardware being documented ad
nauseum, and particularly those things that we buy from vendors.
And we even got into how specifically should a computer be spec'd,
and you'll notice the side issue that developed out of that which
became very interesting at a later meeting -- could the computer
be GFE? There are problems with this -- there are legal problems,
there are problems that it tends to be a little restrictive in
what's happening, and the competition in the computer industry
we know they're not too much for that.

But we took those issues home with us and soon gathered enough
answers that in March, we met again in Tampa -- and by the way, a
part of our objective will be to move around to the various
companies that are part of the activity. We get to know each
other a little better that way, also. At that time, we jumped
the company count up to seven -- . . . was added -- and we also
had PM TRADE participation. I worded that very carefully. It is
still an NTEC/NSIA working group; however, PM TRADE. being a very
close neighbor right on base, was interested in what was happening.
Brian Goldiez, who is also on the panel with us, came along and
participated. It's hard -- once this group gets together, I'll
tell you, it's hard not to be participative. It's one of these
things -- well, I like to use the term that we soon developed the
strongest bonds you could ever have, the . . . bonds of friend-
ship, and it's very inspirational to see this industry/service/
government/military -- all that disappears in a hurry. It's "what
do we need?" What we needed was to examine some of these other
key issues. MIL-STD-1644 -- everybody had gone through that very

heavily. I point out that paragraph 3.2 was singled out. For those of you who don't live and die and know paragraph 3.2 like the back of your hand, it was a wording change in that area covering the software to be documented which we felt was worded in a way -- and we wanted to change it -- so that only the computer software required by the contract would be documented. In other words, early on this morning, Hugh Romine of Singer-Link went through a software documentation facility presentation. A lot of the software that was used in order to generate software, unless it is required by the contract should not have to be documented, should not have to be supplied. But here again, our concern was that the wording that existed in this point in time in paragraph 3.2 could have been interpreted to mean that whatever you use to generate the software, buddy, you supply it and you document it and you test it.

We were ready for the DID review. Frank Jamison and his folks had been laboring mightily to get those ready. Now, another thing we have started our people doing, not associated with computer software documentation, is unrealistic specification parameters. We talked about this a little bit. Hank Okraski said fine -- I hear you -- I believe you -- show me some -- we're collecting. We're also collecting proposal requirements that should be program actions. Let me interpret that for you so you understand it unequivocably. This means that a lot of us -- you may see some heads go up and down -- have run into situations where we find in a proposal requirement things which really should not be discussed or worked over until PDR time. It's just adding to the cost of bidding, to the cost of procurement, to the total action. And also a great concern of all of us, the operational equipment data availability and content. When you're not the air frame, the tank, the whatever manufacturer, it's hard to get that data.

Pressing on, we went to our next meeting, a meeting at Singer-Link. We added two more companies and we also added several hard working individuals from the Government side. . . . Summer joined us from NTEC, Karen Bausman, who is on our panel, and Bob Swab came along to make sure Karen didn't get into any trouble up there in Binghamton. We reviewed the key issues that as key issues what we had done on MIL-STD-1644. Some of this had been done by ADPA and Walt Discenza who is going to follow me will cover that in detail. We also went through in detail -- and believe me, quite late; people were amazed at Singer-Link. The guard said, "You mean those government people stayed until that time?" Way after hours.

How about some projections for what's going to happen next? Well, one of the things is that, though it's not official yet, we can see a move from an NTEC/NSIA computer working group to an interservice/NSIA computer working group. We're working hard to make that happen. Again, we want to have the approval, not just say it happened and then suddenly find out that somebody, for

whatever reason, might disagree. Agency heads must agree -- there must be that amount of formality.

We're going to finalize our inputs to MIL-STD-1644, and the DTD inputs in particular. Believe me, anybody that's here in the audience, feel free to send me any examples you have. We want as many from as many direction -- again, we represent you, not just the companies that are participating.

We want to also examine computer based ATE, the automatic test equipment for training devices. It's becoming very key these days. Training devices more complex, need ATE to examine it. To that end, let me just throw in a quick hype for an NSIA conference in February in Tampa at the International Airport Holiday Inn, covering integrated diagnostics. This is sponsored by the ATE committee of NSIA and the Logistics Management committee, of which my subcommittee is a part.

. . . Hank Okranski took on as a personal activity, but I hope now he is delegating a good bit of the action, and that is coming up with sources of malfunction and degraded performance data. It's tough to come by. How do you get some guy who's got great pride of authorship in his wonderful dingy, whatever it is -- a radar, an ECM piece of gear -- and you go to him and get all the data on how it works, and then you go to the poor guy and say, "Now, tell me how this sucker doesn't work." They don't always want to talk to you about that. But it's something we need in the training area. Thank you very much.

Mr. Daniels

Walt Discenza will give you his report now on the ADP efforts.

Mr. Walter Discenza

Good morning. Bob is a hard act to follow and irrespective of what he said, this will not be an in-depth discussion. I'll try to keep it a little bit on time here and see if we can move forward and yet give you an overview.

It's my privilege to be here and I'd like to take this opportunity to acquaint you with the activity status and future direction of the American Defense Preparedness efforts towards software management and documentation. This activity has been going on for quite some time. The original initiative occurred out of the ITEC conference last year and a task force was formed and there have been a number of activities going on, numerous meetings at different locations. Very good participation. We've had a super group with a set of dedicated goals in mind that are opened up for the benefit of all the industry and government and procuring agencies. It's been a pleasure working with them.

In the illustrious group that we have here, a great deal of effort has been put forth and the ADPA has taken this initiative on several fronts through support and dedication of these participants. Both the individuals involved and their organizations have, as Bobbie indicated, given of time and resources in a very unselfish and self-sacrificing way, and a great amount of dedication and thanks go forward to those guys and their companies.

One of our newest members on the team, Frank Jamison, who joined us in June of this year, I believe, to participate and do activities with regard to 1644 and to help the integration and consolidatation of the activities going forward on a couple of different fronts, especially with NSIA.

The material that is going to be presented here is a composite of the members' inputs who are listed here and their support from their organizations back at the plants. Frank has been of great assistance to us in helping to focus and to see some of the other side of the coin from the Government and procuring agencies point of view, and it has been invaluable.

We'd like to extend an invitation for participation from any of the other government agencies or services in our upcoming activities which will be indicated at the end of this.

The main task that the task force set out to address was related to the well-known problem that we're all very familiar with, how do you manage, control, track software from both a government and an industry point of view. Although it may seem at times that industry and government are at odds, we really would like to accomplish the same thing and one of the big objectives that we have here is to provide you with a product in a cost effective and timely manner that will meet all of our needs. It doesn't do us any good if we get a product that we cannot support or maintain, either, and just like the other side of the house, it's tough for our management at times to get insight into the process and see what is going on.

So, in reviewing what was out there and looking at some of the alternatives, we decided that we would get a grandiose apple pie objective of going forth and trying to get a coherent consistent set of DIDs and structures and standards that would meet our needs as well as the Government's needs. To do this, we were looking at coming forward with something that would allow all of us to manage, track, and control the software development process to the extent that the sufficient insight and knowledge to be sure that things were progressing on a timely basis within the cost profile, and to get there when it was needed to perform the task that was required to be performed with minimum rework, could be accomplished, both from our point of view and from your point of view to control cost.

The training system area has some unique characteristics in that the life cycle of the training simulators are a lot longer than what normally occurs and the types of activities in that wonderful thing called software maintenance, which was really the upgrades and enhancements, occur over the entire life cycle. So we needed adequate documentation to assure that that would be able to be supported and done -- to get that required documentation in a timely and cost effective manner while minimizing duplication. And finally to accommodate the orderly changes associated with new processes, state-of-the-art technologies, and then evolving changes or new requirements as they came forth from weapons systems or from the training community or the end user community.

The first concept that we were involved in was how do we provide the maximum flexibility and yet meet everybody's needs. One of the concepts that came forward is, how about if we take an approach that's similar to the cost schedule control system criteria that exists for cross-tracking on large scale programs. It provides the ability of a contractor to get certified, and once he's certified, to use his own methods and techniques as long as they comply with that thing, and go forward and accomplish the task in their own time and in their own fashion, as long as the overall objective is met. Well, in looking at that thing it turns out that CSCS has a lot of good points to it. It also has some not-so-good points. In trying to address that thing and looking at the software issues where there are tough times getting agreement on some of the specifics, we looked at what would have to occur in terms of the generalities for certification and re-certification, and it went through the process of demonstration requirements. We decided that maybe that's not the best way to go. About that time, a copy of 1644 ATD came out for review or was made available to us, and in going through and looking at it, it seemed like it would be a good basis from which we could move forward to meet both of our objectives or needs, except for a few minor issues. Those, we sat down to look at. That was the structure in 1644 ATD sort of forced a top-down, rigidized methodology which did not account for the problem-solving process in an R&D environment, in which most training simulators are being developed. So, how do we go about addressing that situation, and if we could solve that problem, we had a real good tool at our hands that we could use to assist us.

The other thing is is that 1644 provided for a very systematic or very fixed structure and not recognizing the real world effects associated with things that occur incrementally. You design module A and then you do module B, and you'd like to have module A or the executive done or checked out, or a particular function, before you go on to the next part of it that it interfaces with so that you minimize rework and maximize the cost effectiveness and minimize development time. The overlap in time of which events occured, and when you have short schedules like on training devices of around 20 months, a lot of processes have to go forward

in parallel and concurrently, and yet it did not recognize that.
Also, the fact that when you have these things going together con-
currently, they proceed at different rates, and how do we accommo-
date or handle that. Finally, just like in anything that happens
in real world, you're always bound to run into a problem or a
process, and how do you repeat or allow to go back and handle
things in a graceful manner for problem resolution.

We decided that the best approach we could handle is to take
MIL-STD-1644 ATD as a baseline and then go forward and specifically
address each one of the issues. We assigned action items and the
different participating members looked at the specific areas asso-
ciated with each one of these items and came back with good, con-
structive criticisms or recommendations that we could, as the
industry, provide back for government consideration and for our
own consideration in getting us a viable working, living tool to
help us all solve our problems.

One other issue that came up is that a lot of the problems
involved in the software development process and methodology and
to get the most cost effective systems, especially in this age of
microprocessors and the combining of hardware and software into an
integrated whole, is to address the systems engineering process
and the feasibility of going back and looking at the hardware/
software allocation, and how do we handle that in the process. If
you've defined a top-down, work breakdown structure and module
structure and it turns out somewhere down the path that you could
better do something in hardware, how do we go about reallocating
that and redoing that. We also decided, because of some other
activities and members on the panel being involved with the other
groups going on, to make a concerted effort to go forward and help
bring the activities together and focus them, and coordinate with
the other groups going on. As you can see, there are a lot of
activities going on and we did pull forward and do that and we've
had a lot of participation from that group.

One of the basic issues that has been accomplished to date is
we went back and, being an unbiased group, we look at everything,
whether it be Air Force, Army, Navy, or a particular group's
ideas or concepts, and MIL-STD 483, Appendix 16, for simplified or
non-complex software development, provided a good summarization
of the type of documentation that you would like to have to defini-
tize the software process. We went back and looked at the DIDs
being constructed for SDS and for 1644. It turned out there was
a lot of overlap and redundancy, and we decided to take a target
program of combining the PDS and PDD to eliminate all this redundant
documentation in this area. That activity is proving very fruitful
and has been going forward. Frank Jamison will have a little bit
more to say on that a little later.

The other thing we did was to go forward and we redid a draft
version or a red-line version of 1644 ATD, with a lot of the com-
ments and that is out for internal review right now.

The second issue that we had to look at was the fact that, in a lot of our training simulators, . critical item is the data base that is used to create the environment, and yet it is not addressed and it is not the same as a software development process. It has a lot of similarities but a lot of differences, yet to be addressed.

Finally, the restructuring of the Standards so to meet all our needs, so the Government knows what's going on, what the managers who are managing from the Government side and from industry side can address the right issues, that we can get out of the "how to" and stress the "what" and what is required to accomplish this task, and to provide, for those people who are not familiar with it, a handbook that is not binding but if they follow the procedures there, they would meet the intent and requirements of the overall activity.

In looking at what was going on, a lot of the basic issues, as I mentioned, were being addressed by the other group, although these key issues still remained to be addressed. We haven't totally addressed them, but we have at least acknowledged them, we've got our hit list and our shopping list, and that has led into us producing our direction for the future activities that are indicated up here. These activities, as you can read just as well as I can tell you, we think are viable, that they're going to produce useful results -- they already have -- and we'd like to encourage or solicit the support of the people in this audience, both yourselves, your organizations, any other comments or ideas that you have regarding this activity. We're bound to make it work. We're firm and we have the commitment from the panel members and the ADPA has an ongoing commitment to pursue this.

Thank you for your time and I'll be happy, when the time comes, to answer any additional questions you have regarding it.

Mr. Daniels

Next, Ms. Karen Bausman will speak to us and give us a little about the SIMSPO perspective of things.

Ms. Karen Bausman

In addition to discussing the various standardization efforts that we've been working with, we also are requested to address differences between the various computer program systems in simulation and other embedded computer resources application. Some of these, I believe, include our dependence on the aircraft systems, the various ways that we accept our simulators, and also our tie to our commercial computer vendors. Our aircraft data, a lot of our computer program system modules are dependent on that aircraft data and we have developed additional development steps and documentation requirements to cover these differences and make that identify the highlight of the variances between that design

and our design. In addition, we have instrumented design freezes
in our contracts so that at some point in time we have to look
into making modifications when aircraft changes come along, in-
stead of just incorporating it into the basic design. These have
added additional management constraints to the way we do business,
also.

We depend on a handful of people to evaluate the acceptability
of our simulators by sending our air crew members into the cock-
pit to determine whether or not our simulators are very similar
to the aircraft. That adds a different aspect into our testing
and other computer resources applications may have. Over the last
year, the Air Force has also been involved in two parallel docu-
mentation and standardization efforts. The one is a combined DOD
effort reviewing a Joint Logistic Commanders software development
standard and associated data items, and we have been working with
the Navy and the Army and making additions to their MIL-STD 1644
and associated data items such that we could work with them, also.

Of the two efforts, we feel that the work that we've done with
the Army and the Navy is closer to what we would like to see in
the future, basically because it is directed towards air . . .
training devices, although if we are directed to use the JLC
standards, we can make modifications to them and adopt them to
our needs.

Mr. Daniels

Thank you, Karen. Next, Brian Goldiez from PM Trade.

Mr. Brian Goldiez

We took a lot at what, in our opinion, made us different from
the operation . . ., and we came up with three fundamental items.
One is, until recently we have had little concern with quantity
production and now that we have, for example, cost and we have
automated ranges and we have computers popping up in more and more
systems, we're becoming a lot more sensitive to quantity produc-
tion and the impacts of that in terms of supportability and con-
figuration management impact on software.

Another difference that we have noted is mission criticality.
In an operational mode, if something fails it could be life
threatening. Normally, we don't have that type of situation in
a trainer.

Lastly, at least at PM TRADE, our development process, when
we compare it to the operational world, is abbreviated. It seems
like we're always going 6.2, 6.3, production -- there are all
types of mixes and it never goes in the orderly DSARC type of
process. The impact of these, though, take two forms. From our
viewpoint, in terms of policy, software should be developed

basically the same way. You can always elevate it up to a high enough level that there is commonality across the operational and training device world. The large differences tend to happen with regard to data, because we're often developing a trainer in parallel with the operational system and data problem. Another is in the testing and that usually encompasses a larger amount of testing being done for the operational equipment as opposed to training devices.

What we're basically looking at, in terms of standardization though, is to use something like MIL-STD SDS as an umbrella. Our feeling is that the more commonality we can get within the Department of Defense or within the Government, the better it is. That's at any level. So we kind of like what we see in SDS and to use MIL-STD 1644 as an implementing document in a Statement of Work. We like to see software as a separately accountable and trackable item in the work breakdown structure, and we welcome flexibility in any of these Standards if it's mutually advantageous. I think it's incumbent upon us to put those types of words into our solicitations and incumbent upon the contractor to show us how it is mutually advantageous.

Finally, we'd like to see an end to the proliferation of data items. No slight intended against Frank, because I think what he's doing is good, but sometime it has to stop. We have a problem and the contractors have a problem for every procurement, almost, because of new . . ., and we're going to have to settle down one day and get on with the business of developing software.

Mr. Daniels

Thank you, Brian. Next is Mr. Frank Jamison.

Mr. Frank Jamison

NTEC, as everybody knows, uses MIL-STD 1644 for their software development standard, and of course, the question is why this standard, as opposed particularly and specifically, for example, MIL-STD 1629, which is the Navy software development standard. . . . 1644 was originally developed and it followed very closely in development after 1679 was issued, and it was patterned very, very closely after 1679. It maintained the essence entirely of 1679 as the basic developmental philosophy for software. However, we did make changes based upon the way our training devices at NTEC . . ., and there are a lot of similarities with the way that the Air Force . . . . .

Some of the biggest differences and one of the major differences is the fact as has been previously mentioned, training devices follow generally a relatively short development cycle. Like Walt pointed out, some of them get down to 18 and 20 months. But this is a big difference between that and the weapon systems themselves. As a result, MIL-STD-1679, which was developed initially for weapon systems software development, incorporates a

demonstration and validation phase which, in most cases, we do not have the luxury of being able to . . .   We would like to have it. It's a better way of doing business, of course, but time constraints prohibit us from having this. So this, right up front, is one place we're out of step with the development phase and cycles of MIL-STD 1679.

Another significant difference, another reason why we used 1644, is that as a rule -- there are, of course, exceptions like Brian just mentioned -- but as a rule, we only buy one or two or three of a kind of training devices. Even though it . . . their RDT&E efforts, the first prototype is really an end item and we can only have one or two more. That's not true in all cases, but in many cases. So we're tailoring 1644, or it has been tailored, towards this concept. These are two things we've looked at already that are different.

One thing that NTEC does do and that is somewhat unique, we do buy a large number of different devices that are very, very software intensive. Over 1980 through 1982, these two years, we have added to our inventory 92 major training devices in the field. These devices are essentially in excess of 50 percent software intensive from the development standpoint, so we've got a lot of cross-sectional visibility and exposure to software development over a short period of time.

One of the problems we find with this is that we only have a very, very few people to monitor and to track software as it is developed for these devices. And the level of expertise on these individuals, both internally and externally, varies dependent on their background in software or their experience. It is not only a problem with the Government, it also depends on who gets the particular contract in industry. Not all our procurements go to the big simulation houses that have been doing it for the past 15 years. Today, we're seeing more and more small contractors just breaking into the field and these people, of course, have limited experience and they come in, as a rule, through developing simulation software. . . .   Occasionally a biggie will come through and you'd be absolutely astounded at some of the things they do or don't do, which you think they know better. So I guess the bottom line is, based upon our experience with a large number of software development projects over a very short period of time, we've taken 1644, we made it somewhat formalized and somewhat rigid. I say somewhat because we don't feel it's overly rigid, although that's a big area of controversy which we could talk about all day. By making very definitive requirements as much as possible without stifling creativity and innovation, we find out we get a much better product. We have much fewer problems. In fact, we've had many contractors, contrary to popular belief, who say, "we like it." So to have a formalized procedure that is somewhat rigid does aid in quality software development. It does minimize the problems, and this is one reason why we are very, very up about

1644 new policies and some of the somewhat rigid structures it imposes.

. . . . We feel, of course, as just about everybody in the room probably feels and I know the people up here do, that standardization of policies, procedures, and documentation is a key -- in fact, the key -- to enhance software development and life cycle supportability. Now, to this end, back in January of 1982, we issued MIL-STD 1644A, the first revision to it. It still maintains the essence of the original 1644 and, of course, the same developmental philosophies overall of MIL-STD 1679, and essentially, as we'll find out later, of the new MIL-STD SDS, which will be coming out in the near future. MIL-STD 1644A took the original MIL-STD 1644 and clarified some issues and made it more readable. The biggest delta to it, though, the biggest change in impact, the one we get the most comment on, was the addition of Appendix A to the document, which was really a supportability consideration, a maintainability consideration. For those of you that were in this morning's presentation by Mark Hargrove, "An Automated Configuration Management Approach," you'll understand why we need a common set of rules for software documentation and development in order to get the configuration management visibility and supportability of the software that we feel is necessary. This is true regardless of whether NTEC does it, whether any government agency does it, whether another . . . contractor does it, or whether, indeed, the contractor who developed the software does it. We don't feel that who does it is really a consideration; it should be the same regardless.

Working with industry has been a real, real blessing and a real pleasure working with the NSIA and the ADPA groups over the past year. We have worked with them very closely and incorporated comments . . . just tremendous working relationships and input on necessary revisions and problem areas in 1644A. Nothing is perfect; nothing ever will be, no matter what we do. But we feel we have made major steps forward and we plan, based on recommendations in working with industry and with the Air Force and PM TRADE, in early 1983, to issue MIL-STD 1644B, a second revision to the MIL-STD. We will, of course, have done this in close conjunction with NSIA and ADPA for review purposes. We've already gone through some initial cuts on this and review cycles, and it's looking very promising in draft form. It has gotten intense industry coordination. It's going to be more compatible with the new MIL-STD SDS and the way the Air Force . . . does business. The objective of the new document, of course, is to correct existing deficiencies and to reflect the way that training device software really and truly is developed in the contractor's plant. Both Bob Layne and Walt Discenza pointed out problems with the fact that some of the things imposed by 1644 were not really congruent and in agreement with the way things were done in real life and imposed a lot of serious constraints. The draft revision which we have of this removes many, many of the defects -- in fact, a larger portion of the defects and criticisms that we have

received on the Standard from industry associations and individual contractors. The basic concept is going to be the same, but the most significant change will be that we are going to address and allow instrumental development and review process. This is going to make a big, big change in the way business is done and is going to allow flexibility and make it much more realistic for software development and the documentation associated with it.

Also today -- and I'm glad to be able to do this -- I am delighted to be able to announce we are issuing five new DIDs associated with 1644 . . . procurement. They're not all new, but they're revised and do replace the existing DIDs. They're here in my hot little hands. The Director of Engineering signed the implementing directive this morning about two hours ago. They are in the print shop and will be available next week, and effective immediately, they will be used on new NTEC software procurements. These DIDs are specifically the program performance specifications. We've taken the program design specification and the program description document and combined these into one document. That did away with a lot of redundancy and one of the biggest issues and criticisms we have had of the DID. We've got a new program package document -- a revised program package document, I should say -- and we've got two new ones, but these address items that are done internally to the contractor's development process anyway and from our discussions with industry, they pose no problem. These are the timing and . . . report and requirements traceability matrix. These represent a major revision of software related documentation and they do cover the major . . . .

As was mentioned both by Bob and Walt, we're looking also at systems considerations, not totally neglecting hardware in the future. These DIDs have got hook built into them for a parallel set of hardware-related DIDs that will somewhat similar and follow a parallel development structure to the software DIDs. The new DIDs also will support 1644A as currently written. They are designed to support the new version of 1644B, which comes out in early 1983.

We've been in active pursuit of Tri-Service use of 1644, working with NSIA, ADPA, the Army, and the Air Force. Also, we've been working with PM TRADE in conjunction with the Joint Logistics Commanders Joint Technical Coordinating Group . . . training devices to get Tri-Service coordination and commonality in software development policies, procedures, and documentation requirements. This will continue.

We are actively involved in reviewing and commenting on the new draft SDS, which everybody is looking forward to hearing about in just a few minutes from Bill Egan. Hopefully, our inputs to this document will be incorporated and will bring it closer to the way we feel we have to do business . . . training device software. At the same time, we're not just hanging on that one

optimistic hope. We're also reflecting in our new MIL Standard coming out next year changes that will bring it closer to the way the draft SDS is written. So we're trying to get movement both from their standpoint and our standpoint to get some coming together so we can use the document when it comes out and we won't have to have our own, although we can't rule that out at this point in time.

Last but not least, we want to put a plug in for our Software Engineering Branch, newly formed and in existence for about a year. We've got a centralized focal point now for software engineering for our procurement within NTEC and it's received first rate attention and support from management. We expect that to continue and we're making great strides.

So, what do we see for the future? Continued and aggressive participation with the Air Force, Army, industry via NSIA and ADPA, with the objectives of improving software procurement policies, procedures, and documentation requirements, and developing Tri-Service commonality of these requirements. It's going to make it much, much easier on industry once all three Services will require the same thing in their development process. We're going to maintain an active involvement in the evolution of the new SDS with the objective of incorporating what we feel are the minimum requirements for our training device procurements, or, failing that, as Brian mentioned, falling under the umbrella of SDS and perhaps having a local implementing version or a form thereof of our 1644 type of requirement.

So on that note, I'll turn this over to Bill Egan. He'll tell you about what we all want to hear on the long-awaited SDS . . .

Mr. William J. Egan

I was told by Bob Layne that I'd be the tail gunner on this airplane.

How did SDS get started? It really came about when DOD Instruction 5000.29, which deals with the management of . . . resources of DOD, was promulgated. What happened was that the three Services went off in three different directions implementing that. The Navy had a lot of . . . computer policies already in the works that were used almost immediately in 1679, which was written in 1978. The Air Force went into AF 800 series regulations, and the Army was still, at that time, trying to figure out how they were going to do it. They used 1679 and they used a lot of other Navy documents and other Service documents.

Recognizing this as a problem, the committee on the JLC -- you all know the JLC is the Joint Logistic Commanders and Admiral Williams, the keynote speaker, is the Navy member of that and obviously carries a lot of influence. They have committees or

groups that are joint policy coordinating groups. There is one for computer resources. They in turn set up a sub-group called the computer software management sub-group and that group is responsible for SDS.

In 1979, at the Monterey One conference, the issue was addressed -- what do we do about a Standard? What do we do about implementing 5000.29 across the three Services so that the contractors don't have a myriad of different documents to deal with the different Services, even within Services. There was a lot of difference between NAVSEA, NAVELEX, and NAVAIR regarding . . . 5000.29. What happened was, four things were set up at that time to do to develop a joint Services policy document, to develop a joint Services software development standard like 1679, and to develop a joint Services DID. The cry was that there were piles of DIDs out there; everybody's got a lot of unique DIDs with a lot of applications. There must be a way we can standardize DIDs. The last thing was to develop a joint Service quality and measurement system.

The policy document was promulgated for informal review earlier this year. I put together the comments for the Navy and it was submitted to the JLC, and that document should be in the final form now and should be coming out at the end of this year. That document then trees down to these other things, like SDS and DIDs, as far as overall policy work, ...

SDS, as it was written, had an impact on 483, 490, and 1621 and for the CM and specification standards that are used in audits. Consequently, take the new SDS and all those documents, take the DIDs, and you've got a pile of stuff that was sent out by the Navy in June and by the Air Force and everybody to all of the laboratories and users to review and comment on by the end of August. The last thing people in the field like to see when they are prosecuting software development or trying to do their job is something from headquarters about that thick with 60 days to review. We had a distribution problem in the Navy. It turns out that some people didn't get theirs, and so we've run into a problem where we're not going to meet the schedule . . . . . In getting the attention of people on it, it was sent out for informal review. We'd already sent out 1679 to the Navy for review, and here comes another big software development Standard, and I guess they thought that NAVMAT had nothing better to do than send out stuff to be reviewed relative to software development. So we decided to bite the bullet and accept the Air Force's . . . . because we felt like the comments that were coming in . . . . . .

The new schedule for SDS -- and it's been changed not only because of the Navy being a little bit delinquent, but because there has been a magnitude of comments from all over about SDS. The Navy, quite candidly, is not exactly totally happy with it. We feel that in some cases it is a step back from the maturity of 1679 and 1644. Both of those Standards have been written in blood

by 15 to 20 years of experience in acquiring software . . . in the Navy. So we're now looking at the informal review to be completed in April of 1983 and the formal review of the SDS will be put out -- the current schedule is 1 July, with comments due back by 30 December and official distribution of SDS in . . . I think that's an ambitious schedule and I know that we are going to have some trouble solving the Navy comments, comments from the trainer community, and try to get a standard one that we can all live with.

Currently, the training devices are included. It is the policy of the Joint Logistics Commanders that this will be the one and only development standard for software, and if nothing else, it will be the Bible, the overall covering document. Admiral Williams has made that his policy . . . . I think, echoing what Dave said and everybody else agreed, I think for industry and everybody that that will be of benefit for all of us.

I run into this all the time, and my situation is unique. Aircraft systems that are unique from sea bases, and shipboard systems that are unique from land bases. Software development can be done under 1679 and the SDS; it's just a matter of everybody getting together and coming up with a Standard that we can all work with. I've heard it said that we don't have to do as much testing. I don't know -- I can draw an extreme where we don't exactly want to have a pilot in the trainer simulator learning to fly an airplane wrong. If I'm in that airplane, I'd rather he do his crashing into the Washington Monument in a simulator, rather than an aircraft.

Where we currently stand right now, though, and the heartburn that the Navy has with the SDS currently out is definitions are probably the worst problem. Everybody has got their own idea about that. There are 28 in the Standard. The Navy considers 9 of them to be wrong, absolutely wrong, 11 to be poor, and 8 seem to be okay. That's not a surprise to me because in the 1679 review, we got something like 27 comments, 6-1/2 pages long alone, on the definition of . . . The more experts that get involved in definitions, the more it seems like they can't agree on it. Another problem we find with it, as it is currently written, it's not easy to use, it doesn't flow right, and I think that the work which was done on 1644 about making it more of a management school so that we don't have to have all the resources in the software management area to monitor and prosecute software being bought.

The last section is it will have to consolidate and resolve many details and, in some cases, conflicting comments. It happens all the time -- you get one expert coming in and saying, "I've got to have this," and another expert coming in saying, "I've got to have this," and another expert comes in and says, "I've got to have it exactly the opposite." As an example, the area of reserve. SDS does not even include a requirement for reserve. The trainer people feel that 50 percent is an absolute minimum, and in some cases it's probably true. In 1679, we feel that 20 percent . . .

The problem that we have currently is a lot of systems go in service with no reserve at all, even though the best intention was to have that. But it doesn't work out that way. Twenty percent may be low and fifty percent may be high, but there has to be reserve.

In conclusion, I'd like to say that the SDS will be the Navy Standard, it will be the AFLC, the AFSC, the DARCOM Standard. There is pressure from JLC and the Under Secretary of Defense Martin to make this a common Standard for all software . . . . in DOD, and I think if we just all get onboard and not try to fight it, we will come up with something that will be beneficial to the taxpayers and I think you'll find . . . . .

Mr. Daniels

Thank you, Bill.

I think if you heard anything here today as a standard theme it's that we do need to keep the communication lines open and I'd like you to know that NTEC, for one, is committed to do that. It's been refreshing this past year to see the mutual support and co-operation between industry and government, and I don't think anybody here wants to lose that.

At this point, I'd like to invite questions from the audience. You can direct them to whoever you'd like. If you have some comments or suggestions, those are fine, too, and if you have something that's extensive and you don't think that you could get it out on the floor here the way you'd like to or if you're shy, then you can jot that down and pass it to any one of us. You've got a representative for your side of the house anywhere -- there's the NSIA, ADPA representing industry and then, of course, there's anybody in the Service you can get to through us here on this end of the panel.

So with that, if you have any questions, it's your turn.

Question -- (Cannot be heard)

Mr. Daniels

I think that Walt Discenza is the guy who mentioned that. He can respond to it and if he doesn't want to, I'll wing it a bit.

Mr. Discenza

I'll be happy to address it. That wasn't quite what came across. The idea was to provide a system or structure for the contractor that he could get a certified process and once the process was certified, then he would have, under his own control, the actual methodology used in developing a software process and tracking it. CSCS is a generic thing to track cost and schedule operations for an overall program. There is a certification

process required at contractor's facility and it's either for an R&D type or production type of activity, with certain reports, certain reporting goals, certain things in place to allow that to happen. It turns out, trying to put that methodology in place looked to be more difficult than trying to get a fixed set of standards, procedures, or guidelines in place to allow it to be accomplished.

Question -- (Cannot be heard)

Mr. Egan

That's probably one of the problems with it right now. SDS is not treated like a program design manual. ADA is also going to be . . . SDS isn't compatible with ADA right now. . . . and some other problems in it, it has to be revised in order to implement ADA. I hope we can get that sort of thing in, at least during the formal review.

Question -- (Cannot be heard)

Mr. Daniels

I don't think you can really separate documentation from the development process if you're in an environment where you're trying to monitor the progress of a developer and assess where he is, what the current status of the system is. So I see them really as being parallel. I think that the documentation is the only visibility that the customer has to indicate what the progress has been, and we are talking about management practices in the sense that what kind of documentation is delivered and when and what does that represent in the way of the development of the system. So they are tied very closely together. I had the same problem when I was asked to moderate this panel. Are we talking about standardization in general or documentation, period, and should we just zero in on the DIDs. But the DIDs are a big part of that and that's been a big effort this past year. But we need to standardize the approach and we need to standardize those DIDs that are used so that we don't have so many of them that everybody with his own hair dryer, if you've ever heard that story.

Question -- (Cannot be heard)

Mr. Daniels

I don't think that the intent is to stifle innovation. In particular, I think you mentioned the productivity issue. I think before too long we'll have a lot of automated software development and associated documentation with that, and I don't personally see anything inconsistent between that and what we have in 1644 or the other Standards. Those Standards generally are not that restrictive, or at least, I've never view them as that restrictive.

Maybe our friends from industry do think they are. Maybe they think we're telling them precisely how to do things. Most of the things that are advocated in those documents or Standards are the same sort of things that Dr. Layne indicates are the right way to do things as far as developing software. Define your require- ments early and do them completely and accurately, and make sure that -- we all recognize that there is an iteration from phase to phase in software development, but every time you do that, there's some wasted effort and trying to go back and redefine requirements after you've got all the way to approve the design or maybe into the coding or maybe into the implementation phase, all of those things are precisely what we're trying to do with the Standard. We're just trying to lay out a systematic development process. We're not trying to get into just exactly how you set up your team or do everything in plant. We'd like to be sure that you've got a management philosophy and a good approach to the thing and really are on top of it, but we wouldn't -- I guess when you see things like top-down design and top-down development, you think that maybe you're not allowing for some kind of . . . development in areas where it would probably be okay to go ahead with it. But I don't think that the intent is to be that restrictive. It's just to keep those people who are totally inexperienced or those that happen to be overworked in other areas and have a relatively short supply of software, don't just give things a lick and a promise and try to bluff their way through and nobody can check and tell what they're doing. That's certainly a lengthy response. I don't know if it got in on what you wanted to hear.

Question -- (Cannot be heard)

Panel Member

We use a rule of thumb, at least in NAVMAT, that the develop- ment of software is about 25 percent of lifetime costs. So, the way you develop it is going to dictate the way it's supported. The proof of the pudding in 1679 and the documentation associated with that is going to be, hopefully, in a lower life cycle cost in the ownership cycle. Therefore, if you've developed something and gone off without some sort of standard approach to it, like using a standard language, using a high order language, top-down design, documenting everything, believe me, we've all, I know, suffered with trying to support a system where the documentation is poor at best. Those are some of the written in blood things that these standards are trying to take care of. We're not trying to restrain development; the nice things of top-down design and higher order language, all those things appear to be the consensus of industry of what you want to do. What we're really looking for is the af- fordability of how we're going to support it. That's why we're more concerned with how it's developed. At least, that's my per- ception.

Panel Member

I'd like to address it a little bit from ADPA or industry side. I don't want you to get the misinterpretation of what's there and I hope it came out in those slides. It was software management and documentation control. Indicated in there, which I did not high-light, is a lot of the complaints back from industry is too much of the "how" and a lot of subjectivity in the "what." We'd like to get the "what" defined and defined to the fullest extent possible and then allow us to have the freedom to go ahead and do it and use the latest methodologies and techniques to accomplish that. One of the key issues that we've got here is to meet government's needs. We've got to provide them with sufficient and adequate documenta-tion to meet their overall life cycle support requirements and for a training simulator, they tend to be a little bit different, both in terms of what the documentation is and how it is organized, and the extent of it and it is from a weapons systems point of view -- the same with the sparing requirements. We have a lot of push in this area and there has been a lot of movement made to try to accommodate that and to restructure those things which are our long-range objectives to provide the basis and the guideline to allow companies the flexibility, as was indicated there, to pull in the new technologies and methodologies to contain the costs, to make use of the latest innovations and productivity improvement, but you have to deliver a product that will meet everybody's needs.

Mr. Daniels

If there are no other questions, I guess we can get ready for lunch. Thank you very much for attending.

LUNCHEON MEETING

<u>Mr. Layne</u>

It is my extreme pleasure to have the opportunity to introduce a high ranking member of our neighboring armed forces, but before getting to him, I'd like to mention that the Canadian presence here this year is not just a happenstance; they didn't drop off the Disneyland bus as it came through town. In fact, we specifically had a member from Canada on each one of the program panels -- the technical, user, and management -- and just adjacent to this array of heavy gold that is in front of you here we have the whole contingent of fierce Canadians here with us. I'd like to come right to grips with this neighbor thing because there are many of us here in the U. S. that view Canada as the 51st state. My wife, who is from Brooklyn, has always informed me that that's the 51st state. When I discussed this with Admiral Wood, he stated that coming from Canada's smallest but fiercest province, Prince Edward Island, they stand ready to take them all on to prove that PEI has its own soverign entity. Now, while that doesn't deal with the question, it does provide a proper lead-in to show why the Royal Canadian Navy found itself with a proverbial tiger by the tail when one J.C. Wood joined the Royal Canadian Navy in 1951 as an ordinary seaman. In three scant years, he decided that if he was to have the leverage to make things happen, he would need officer status. In 1954, he was selected for officer training. His interest in training at that particular time was more of a personal one and from his initial training to become an officer, he stepped through additional training at the Royal Navy College in England and a stint on a Canadian destroyer. And then selection for training in submarines at the U. S. Navy Submarine School at New London, Connecticut. Admiral Wood told me with great sincerity that this tour was his best-loved duty. So now it's out -- another submariner. No wonder Admiral Williams was so comfortable here -- he had all his cohorts around him.

In the RCN, submarine work is also considered the silent service. Admiral Wood, however, soon became known as one of the Royal Canadian Navy's most outspoken members. It seems that the RCN works on a similar theory to some U. S. industry and that is, if you can't shut them up, promote them. Little doubt that he strode upward to higher ranks, soon taking command of the submarine squadron in 1972. With the rank of Captain in 1974, he became Deputy Chief of Staff, Operational Readiness at Maritime Command Headquarters. With that fierceness that I mentioned earlier, he continued his rise to his present rank of Rear Admiral, with the post of Chief, Maritime Doctrine and Operations for the Royal Canadian Navy.

But how about a snapshot or two of the man in the uniform. Both he and his lovely wife, Joan, are excellent skiers. For those that might ever contemplate taking him on in the squash court, he is

rated as a Competitive Level player. That means he could have taken it up professionally if his interests had turned that way. He's also a skilled woodworker and carpenter. Now, I must say here that a certain Army Colonel, Artillery, sent me on a fictitious trail with a report that the Admiral did the totem poles at the Canadian complex at . . . Not so, but he could have. The Admiral shared with me that he uses his hobby as a relaxant to take the wrinkles out of his mind caused by happenings at the Canadian equivalent of our U. S. Pentagon, which he calls Disneyland North, by the way.

Admiral Wood joins us this afternoon to give us a view of where the Canadian Navy is today in training and simulation. Please join me in welcoming a fellow American -- Admiral Wood.

Rear Admiral J. C. Wood

Thank you very much, Bob. Ladies and gentlemen, I'll put on my badge of office now because I can't see a thing without them. I've got a few words written here. The only thing you didn't tell them, Bob, was my great joke. People say, "How come you're bald?" A lot of people have a lot of excuses about it, but my wife gave me the best one. She said, "Just tell them your hair has been fondled away." I use that every now and then.

I very much regret my wife, Joan, is not here today, and as we were just discussing at the table, it's very sad. She has an incurable disease called shopping. I can't seem to get a handle on it and the medical profession can't seem to cope with it. It sure hurts from time to time.

First of all, on behalf of the Canadian team that's here and myself, I'd like to thank the National Security Industrial Association for their invitation to us to be here today and to permit me to speak to you. I'm always a little worried when I get speaking on a topic that I really don't know a heck of a lot about and it reminds me of the story -- there was a small English village and there was a little private girls' school there. The headmistress got a little concerned that perhaps the young ladies weren't being educated across the broad spectrum of social problems that they might encounter, so she went along to the local vicar and said, "I'd like you to come over one evening and talk to the girls about sexuality as seen by a Christian." The vicar thought about that a little bit and he thought that was part of his mandate. He was a little worried about his wife, though; she was kind of square -- typical vicar's wife -- so he just noted it in his diary that he was going to speak to the girls' college on the subject of sailing. Now, the great evening arrived and he told his wife he was going to the girls' college to give a little lecture, and she noted in his diary that the subject was sailing. She was a little surprised because she knew he did not know anything about sailing. So off he went, he did his thing, and about two days later, his

wife met the headmistress of the school walking down in the local
supermarket. The headmistress said, "We were really delighted that
your husband came over and spoke to the girls on that topic. It was
something that they really needed." The vicar's wife looked a little
surprised and she said, "I really don't know how he spoke on that
subject -- he's only tried it twice; the first time, his hat blew
off and the second time he lost his glasses."

I'm fully aware that after such a splendid lunch as we just had,
the last thing you want is about a half-hour of me talking up here.
I might shift to French and get carried away every now and then and
then you'll all be puzzled. So I'll keep it short.

Most of us were here yesterday and heard Major General Day,
U. S. Marine Corps, and I think he went right to the heart of the
matter. He started talking about the cutting edge, the guy up front.
He reminded us that the little man way out in the front of the
battleline has the same bayonet and the same rifle and the same
grenade that he had at the turn of the century. He reminded us all
that we haven't done a whole lot to improve him. We've a lot of
systems that feed information back to the back end, but we don't
seem to really be improving the lot of the guy out front. I don't
intend to add to what General Day said except to say amen. I think
we really have a problem. I know in Canada every now and then we
get hung up. We can't understand the difference between leadership
and management and we start talking about money, we talk about man-
aging budgets, and then we seem to think we can manage people. I'm
from the old school -- I still think leadership is what we're talk-
ing about and if the budget kind of goes sour every now and then,
that's the way it goes. But I think we must not lose sight --
we're all here for one purpose; to improve the training and the
readiness of the guy out in the sharp end. I hope we're not here
to provide statistics back to our respective Pentagons to prove
how well we're doing in the middle, because we're really not im-
portant.

What I'd like to do is just sort of skim across what we're
doing up in Canada. For two reasons -- a, I don't have much more
to say, and b, we are behind. I think we know we're behind and it
would be good business for some of you -- we don't throw around
great big bucks, but we've little wee ones up there. They're worth
about 78¢ right now, but we do issue them from time to time and
we need help. So I'll just go through what we're doing and where
we think we're going, and hope it works out from there.

I guess like all Western nations, we're kind of hung up --
we've got some problems. There's not enough money, the economy is
kind of sick, and everything costs more. What we've tried to do in
all our major capital acquisition programs is ensure that we include
training in the first cost. We're very short-sighted up in Canada
and when we get a major capital program rolling around, like a new
ship or a new airplane, and the money gets tight, we say we have
to cut down. What do we cut down? We cut down the training and the

support. And then we get the great beast out in the field and say, "who knows how to run this and how are we going to train anybody?" So we are really consciously now trying to make sure we protect the money that is absolutely essential to train the people to operate what we're going to get.

We've set up a permanent simulation working group that really serves as a focal point for all this sort of activity which is going on in our forces. At present, we're working on a 27-minute simulation film. A lot of it is going to be shot here in Orlando. I don't think it will be a blue movie -- I haven't seen the schedule of it, but certainly when it's finished, if it's worthwhile, we'll be delighted to share it with you.

One upcoming event that may be of interest to some people here. We're going to have an Army technology training device exhibition -- we call that ARMX for shot -- up in the . . . . and if you don't know where that is, I don't either, but it's near Montreal. Not a bad place. That's going to happen in April 1983. We already have a fair collection of both European and North American industries who are going to exhibit things there and if any of you are interested, just contact one of the Canadians that are here. We'd love to have you -- April, there may be no snow, so you can bring your golf cart, I think.

I'd just like to look at the three Services and don't get fooled. We say we're integrated; that's a myth. We are when we fight for money up there, but I don't know a heck of a lot about the Army and the Air Force. I haven't really tried very hard, I must admit. So when I start talking about Navy things, I think I know what I'm talking about. When I talk about Army things, take it with a grain of salt. When I talk about the Air Force, forget about it, because I don't know what they're doing.

But let's lock at our Navy. In the last couple of years, we've started to get on the simulation bandwagon. We put a new bridge trainer in on the West Coast of the . . . , which is just near Vancouver -- that's our sunny climate out there; it rains all the time. We use this to train our young officers. It took us a little while to catch on, but we discovered that young officers rushing around in real ships practicing collisions, groundings, and other things, was very expensive. And besides that, that's a prerogative of senior officers, and why the heck should they get to do that? Also, in Halifax, we've installed in our Warfare School there -- we keep everything split; we have an East Coast and a West Coast Navy and does it ever get complicated. They don't speak to each other. But we put in a Maritime Warfare School trainer, an action speed tactical trainer, in Halifax -- it's made by Ferranti, I think. It's been in about two years and it's really to exercise naval officers and naval aviators in the decision-making process in the multi-threat environment. We're extremely pleased with it. It has the full input from all the expected sensors you'd expect to find in such an apparatus, and it has lots of room for growth. As I say,

it's been running about two years and we're very pleased with it.
Really, you can just do so much with that sort of simulator that
you can't do in the real world environment.

What's the Army doing? That always gets a little confusing
and I'm always reminded of a little story about the Army. It seems
a high priced executive, who had had a very successful business
career - he was only 35 and he was worth about $10 million. But he
suddenly found the big deals were falling through. He wasn't really
making money like he thought he should so he went along to see his
doctor, the good old G.P., and said, "Doctor, I'm losing my touch.
I don't know what's happening, but the big deals are falling." The
doctor gave him a good medical and he couldn't find anything wrong,
and he said, "I'm going to send you to a brain guy -- they're
pretty clever these days and he may find something there that is
wrong and he'll sort you out." So our friend went off to see the
great brain man and after a very thorough examination with all the
scans and associated things, the doctor said, "Well, I have a bit
of good news and a lot of bad news for you. Your brain is dying.
It's had it. You've burned it out." The patient got a little pale
and trembling and his fingers started to twitch. The doctor said,
"Cheer up -- with modern science and modern medicine today, we can
sort that out. We can give you a new brain. The trouble is, it's
an expensive proposition." Our speedy executive had a fair bit of
money, so he said, "What sort of numbers are we talking about when
you say expensive?" The doctor said, "Well, there's a range. I
can give you a new lawyer's brain for about $10,000; if you want to
go a little more posh, we could use a doctor's brain. They're
about $15,000. If you really want to go first class, I can give you
an Army officer's brain for about $25,000." The executive said,
"I don't understand this -- a lawyer for $10,000, a doctor for
$15,000 -- but an Army officer's brain for $25,000?" The brain sur-
geon said, "But don't forget, the Army officer's brain has never
been used before."

So what are we doing with the Army besides changing brains?
Well, we've recently installed six of the . . . auxiliary observed
fire simulators, which I also believe the U. S. Army is buying.
There's a lot of detail about them, but what we found in about a
year is that we've saved enough ammunition to buy some more, and I
think that's the real name of the game. Rather than push bullets
down the range and watch them go bang in the mud, if you can do a
lot of simulation and get some value and feedback out of it, you
save a lot of money, you reinvest that in training, and off you go
again.

When we acquired the LEOPARD tank, the Army began to realize we
did need some cost effective training systems and they started to
look pretty hard at them. We're currently trialing the DARCOM-
sponsored . . . Mark 60 this winter. It's modified to our LEOPARD
standards and we're really optimistic that we're going to get a
lot of ammunition savings in that, as well.

On to our Air Force -- they consistently have led the trail in simulation and training. It took me a long time to hoist this in as to why, but I suddenly concluded that they wanted to be sure they could fly before they took off, which is not a bad proposition. As you know, we bought the Canadianized P-3, which we call the AURORA, a couple of years ago. We bought a very large training package which goes with it. It's been operating now for two years and we are extremely pleased. We finally put the right amount of money in the training system. We're also in the process of taking delivery of our first few F-18s, which are coming along. I am well aware there is rather a warm controversy going on in the Pentagon about the F-18. We're having trouble up north finding a name for it, you see, because we work in two languages, which makes life a little complex. So if you're going to try to name a new aircraft, you try to find a name that is the same in both French and English, so the great men -- we call them the grownups, the guys who work above me -- the grownups invited us to pass up some opinions on what we'd call this new airplane. One of the bright young Air Force staff officers suggested the name of Hoover. Now, Hoover is a pretty well-known house appliance up in Canada -- it's a vacuum cleaner and I think you have them down here. So this name was sent up to the grownups with no comment. But back came the comment, "Why are you calling it the Hoover?" This young man said, "Well, it's sucking up all the money in everyone else's budget."

I don't want to keep you too long. I think I've talked a bit about the Navy and a bit about the Army and a bit about the Air Force. I guess in conclusion I'd just like to say we're firmly committed to setting up proper training, buying the kit, and getting on with it, simulation and all the other things.

One of our biggest problems, as we go along here, is in money. We go out to industry because we don't really have a large body of informed people in simulation training in-house. So we go out to industry and they always indicate to us that the only thing that will serve our unique purpose is gold-plated and costs a fortune. So we fall in love with a supplier and we get married and then he tells us what it costs and we have a quick divorce, because we simply cannot afford to be gold-plated. I don't think anyone can. What we need is the best, most efficient way of training our people -- and when I say best and most efficient, it's probably got to be the cheapest, too. Now, you might find that a bit of a dichotomy, but I think if we work together between industry and the military, we can come to a level that (a) you can produce and (b) that we can afford. That, I think, is one of our biggest problems.

Again, in closing, I would like to thank you for your invitation to speak to you here today. I'd like to thank you for the generous way in which you shared information with us, and thanks for being such friendly neighbors. It would be pure Hell up north if you weren't friendly. I'd like to remind you that you always have a warm welcome, even though the weather might be a bit cold, to

come up and visit any of our training establishments, to look at
any of the things we're doing. There are some things we do reason-
ably well and others we don't do very well at all. But I think with
a bit of cross-fertilization we can produce a heck of a lot together.

Thank you very much. It's been a pleasure.

Mr. Layne

Thank you, Admiral Wood. Just one added note before we rush off
to the start of sessions again this afternoon. This is not a hype
for my company, Hughes Aircraft, but let me share with you one of
the nearly best-kept secrets in America and that is that those two
satellites that are flying around over us and launched by the space
shuttle are Hughes designed and constructed. One of them was . . .
Eskimo word for "friend," for Tel-Sat of Canada. I want you to
know that, great scientific accomplishment that it was, I really
feel the biggest thing in the whole deal is that now all those in
Canada, long deprived, can watch the "I Love Lucy" and "Bowling For
Dollars" re-runs that we've been looking at for all these years.

Thank you very much and off to the sessions.

SESSION VA
U. S. NAVY USER PANEL

(Due to technical difficulties, the introductions and presentations by RADM C. W. Taylor and RADM J. H. Fetterman were not recorded.)

Rear Admiral G. M. Furlong, Jr.

. . . . . in the area of simulation. I sit out at Miramar, where my headquarters is at San Diego, and in my headquarters building I'm surrounded by 11 simulators whose initial procurement cost exceeded $80 million, two of them in excess of $20 million apiece. The support and updates that have gone into them have run well beyond $100 million now. That gives you some idea of the amount of money that we have invested, as a Navy, in these simulators -- we're talking flight simulators right now, or systems simulators -- and how important we feel they are in our way of business. We are directed by the Chief of Naval Operations in the various syllabuses that are designed to support putting qualified aviators into the Fleet with a certain number of simulator hops. When those simulators go down, when those trainers go down, we start to stack students up like hardwood. We have a syllabus for an F-14 pilot now. I won't bore you with the statistics, but we put an F-14 pilot into 47 sorties now in trainers while he is working up getting ready to go to the Fleet. It's a very, very expensive business all the way around. A young aviator, a fighter pilot, by the time he reaches his first fleet seat, has somewhere between 2-1/2 and 3 years in the Navy and we have $1 million invested in him. And so every hop, whether it be in an airplane or in a trainer, is very, very important, both from a flow standpoint and an economic standpoint. You've all been familiarized, certainly recently, with the E-2C, which is the radar long-range airborne early warning aircraft that the Vice President has been using so effectively down in Florida. To put a young student aviator, naval flight officer, a radar system operator, into the Fleet for the first time, we have to put him into a trainer that initially itself cost well over $20 million, for about 137-1/2 hours. That's what is required in the syllabus before he is certified to go to the Fleet as a journeyman. So we're talking about an awful lot of very expensive time and when these trainers don't operate as they are designed to operate, we begin to have serious problems. I, for one, ask the question and quite frankly, I'm not intelligent enough to know the answer yet, as to whether we're spending too much money to gain that last 10 percent of capability. Sometimes people refer to the 90 percent of the total funding we spend to gain that last 10 percent. How important is that? It immediately buys you complexity; it immediately buys you problems as far as reliability, maintainability, and supportability is concerned. Some of these trainers are so sophisticated that our college graduate aviators cannot operate as system operators in the instructional capacity that is required unless they are doing it full time. They cannot go over with a student and sit in the instructor's seat and run the trainer on a part-time basis. They're just too complex. We have to have people who run those things who know the machine backwards and forward and stay with it all the time.

We have, I think, a couple of other problems certainly, and I'm problem oriented. Supply support is the Achilles heel of the trainer community, as far as I'm concerned. We have never been adequately supported and, of course, I'll say the same thing for airplanes that anyone else will -- we'll never have enough parts. When you ask a fighter pilot whether he has enough thrust in his engine or not, I don't know of one yet that will say he does. So you're never going to give me enough, but our reliability is not as high as it should be and as a result, the operators begin to sense a great amount of frustration. If they go to the trouble to go over and sit in a simulator and get ready to fly it, it's like an aviator going out, jumping in an airplane, going through all of his pre-flights, and then, for whatever reason, because of a system malfunction he can't get airborne. We need maintainability, reliability, supportability. Across the board. We don't have it to the degree, certainly, that we need it right now.

I think that in part, and I've got a couple of items here I wanted to cover, there are all sorts of solutions to some of the problems as we see them. One is the COMS, which I think most of you are probably familiar with -- the contractor operation and mainte- nance of simulators -- that's coming onboard in the Navy now. Two of the more sophisticated simulators at Miramar will be under con- tract support by the first of April of next year. It's not complete yet. I think we need supply support, adequately funded and directed and controlled in the contract with the contractors. I want to put the contractor's feet on the fire but give him the means to carry out that responsibility of directly supporting the simulators. I think that's very important.

We need expanded contractor maintenance support, not only for the O and I level at the Navy, but depot level, as well. Get it across the board. If we're going to go that route, let's go the whole way and let's do it properly to begin with. We have prob- lems through the years, just as the Air Force has had and the Marine Corps -- all of us; when we bring major new weapons systems aboard for the first time, the amount of money involved is mind boggling, for one thing, and for various reasons in the budgetary process, we do not fund particular aspects of it to the level that we know we're going to require in the out years. Then it's a catch-up ball game from then on. I'd like to see, when we go to a new system like this, that we start off right at the beginning, fund it correctly, put the responsibilities where they should belong, but also give those people the wherewithal to carry them out.

Thank you.

Captain K. A. Dickerson

I'm with the Chief of Naval Air Training, and it is our respon- sibility to train the undergraduate pilots for the Navy, the Marine Corps, the Coast Guard, and some selected foreign students.

In the flight training program that we have, flight simulators, of course, play a very integral part within the training command. We have our maritime pipeline, our rotary wing pipeline, and our strike pipeline, the three primary training fields that we're concerned with.

Simulator training supplements, rather than substitutes for aircraft training in all of our training programs. Employment of the simulators has increased during the past 12 years, while the flying hours have not significantly changed in our pilot training program. At this time, we average between 40 and 60 percent of the total hours are flown in simulators. We train on the average of 1500 to 1600 pilots on a yearly basis. In the Naval Air Training Command at this time, we do not have any simulators that have a visual capability, and most of that is the cost pricing on the early visual simulators.

We have studies underway to define cost benefit trade-offs to add visual simulators on some of our trainers that we have in the system now, both for the T-34 simulator, which is our aircraft in our primary flight training, the TH-57 simulator, which will be utilized in our rotary wing training, the T-44 simulator in the advanced maritime pipeline, and the T-2 and A-4 in our advanced strike pipelines.

The next major training system program that we have in the training command is the VTX-TS, which calls for advanced visual displays in state-of-the-art simulators. As usual, costs have a significant impact on the future of flight simulation training in the Air Training Command. The extent, breadth, and depth of the simulator involvement will depend on specific costs and the associated specific transfer of training effectiveness. An example of this kind of close look at cost impact is planned -- we have a planned evaluation of our training effectiveness of the TH-57 simulator platform motion system. If it can be shown that the motion produces no important training gains, management may exercise its option to apply the costs of platform motion to purchase of a visual display for the simulator, thus increasing the training capability of the device to supplement a wider variety of training tasks.

Bottom line in the Naval Air Training Command, we're looking ahead to increase flight simulator application and we've established a baseline of integrated simulator aircraft curricula to support this plan. We feel that if a task can be practiced, it can be mastered, and if it can be mastered, the mastery can be transferred.

Maintainability, reliability, cost effectiveness, software update, timely delivery -- all of those you've heard before. Getting the simulator in place before, preferably, and if not before, at the same time as the introduction of the new weapon system.

I'll give you to our submarines at this time.

Captain S. L. Ward, III

As I heard the Admirals talking about various training device problems, I was looking through my notes and found that almost all the points that I was going to make had been eloquently and adequately made before. But I think it would be useful to describe to you some of the perhaps unique training requirements that the submarine community necessarily needs because of the operational configuration and operational patterns of those ships.

At the Naval Submarine School, we are involved both in the pipeline training as you are in Corpus Christi, as well as the Fleet training and readiness requirements that John Sullivan is involved in out in TRITRAFAC. I'll try to describe some of the problems associated with that latter function because they relate to the former, as well.

. . . . . I'd like to give you a . . . on some of the reasons why the shore-based training, specifically the simulation devices, that so proliferated our training environment are unquestionably a very important adjunct to maintaining the submarine force at battle readiness and I'm sure, quite equally, to the other communities within the Navy.

First of all, within the submarine business itself, there are limited opportunities at sea to practice important basic skills and one can imagine that, with a force as dynamic in terms of personnel input and outgo as our force is, and I believe that applies again across the board, we're always bringing in new officers and new men, we have to continue practicing these basic skills. We can't assume that they are learned once and retained forever. I'm talking about basic skills such as sonar operator training. The sonar, on a submarine, is a primary sensor and its employment is critical to the submarine's ability to do the multitudinous tasks that it is assigned. And yet, at sea there are a paucity of targets that are even worthwhile tracking, much less targets that either exhibit some of the characteristics of the potential threat or targets that exhibit characteristics that require the sonar operator to do certain things with his equipment that he would do in a threat environment. So sonar training at sea is very difficult to do unless you have two or three other ships out there, which is difficult in these times of shortness of ships and overload in terms of Navy commitments.

Similarly, the whole approach and attack problem that a submarine is destined to do -- that is, stalk a ship and sink it -- that is very, very difficult to conduct at sea because, again, it requires expensive ranges to conduct the actual weapon release, expensive targets and retrieval services, and so forth, all of which are difficult to put together in these times and so, again, simulators and shore trainers are an important complement to conducting this evolution at sea.

Certainly, surface ship handling of the type that Admiral Wood talked about at the luncheon, is a very, very important skill we need to practice more within the submarine force. When you consider that less than 3 percent of the submarine's lifetime when it is at sea is spent on the surface, and less than 40 percent of that time is spent in restricted waters environments, you can see that the opportunities for practicing that skill at sea are almost non-existent. So there are fertile fields for finding devices ashore that can complement our ability to conduct that evolution properly at sea.

Another problem we have within the submarine business -- and again, I don't think it's unique to the submarine forces -- is incompatibility between the ship's operation and training conditions. Submarines, when they are at sea, are usually going deep and fast to get somewhere, where they're deep and slow doing what they're supposed to be doing. On the other hand, the majority of our training requirements require the ship to be just below the surface, probably going slow and exposing some sort of antenna or mast to do such things as basic periscope skill training or training of the radiomen in communications. Again, we not only need the conditions I just described, but we also need a relaxed operational security condition, which frequently submarines don't operate under. What I'm saying is that submarines are really the silent service and we don't talk, much to the chagrin of the rest of the Navy. People think that we just don't want to talk to you, but in fact, it's because we're told not to because we're supposed to be covert and not show everyone that we're there.

All these things militate heavily against trying to do some of the important training that has to be done. EW is a small, but very important submarine role, and it's difficult to conduct that kind of training at sea if you're supposed to be deep all the time and the ESM operator is sitting in his ESM room waiting for the antenna to be exposed and it's only exposed 4 percent of the time he's at sea.

Another problem we have in certain types of training aboard ship -- and again, I don't think this is unique -- is the expense, difficulty, and impracticality of creating a realistic training environment to practice and test the ability to cope with certain . . . and skills. Damage control is a typical example. We simply can't let smoke bombs go off in the middle of a submarine when it's submerged and say, "now we have a fire and now we have smoke." As a result, our fire fighting training at sea does not have the realism that we would like to see it have and at the same time, our concern for how we would cope with a real fire rises when we consider that problem.

The last category which John Sullivan will elaborate on in terms of our training needs and why ashore training devices are so important to us is the sheer non-availability of certain types of ships to do any training on. The SSBN force is the archetype of that where

we have two crews, one of which is manning the ship and the other crew is getting ready to man the ship. They must spend a great deal of time not only maintaining the basic skills of submarining and so forth, but also the very complex skills of maintaining those missile systems, the supporting navigation systems, the launchers, and everything else battle ready, be able to cope with the types of problems that could occur during a countdown, so that we in fact do maintain the absolute credibility of that part of the deterrent triad.

These are four different categories which require that the submarine force move heavily into the shore-based simulator business. We have, but again, with the kinds of problems that the Admirals spoke of before, the irregular funding -- Admiral Wood even talked about that at lunch -- the complexity of our trainers and the fact that they can't be maintained by sailors but often have to be maintained by technicians which drives the delivery costs way up, and the long lead time that often occurs, the lag time, rather, that occurs between the introduction of a certain system into the Fleet and the training device that supports that kind of device on the shore -- these are problems that the submarine force, as the rest of the Services, have to deal with on a continuing basis. It's all driven by the issue of practicality and simplicity, which do not characterize our training devices, with few exceptions. They are often gold-plated, as Admiral Wood said. They are gold-plated devices and we simply can't afford them and often the gold plating even makes them not as useful to us because there are too many things to do and so as a result, we can't do the simple things we'd like to do ashore before we take the ships to sea.

So, in confirmation of what has been said before, we have a lot of need for shore-based training in the submarine business. We need to work harder at trying to simplify those devices. We also need to work harder, I believe, in terms of linking the Fleet, the users, with the suppliers of the equipment, not only at the concept time but during the evolutionary cycle where the system is taking form to make sure that our training needs are validated, to make sure that the practicality is validated, so that when the device comes out the other end it, in fact, is going to satisfy our training needs and improve battle readiness.

I'll turn this over to John now to talk about some specific problems.

Captain John L. Sullivan

As you could hear, Sam doesn't have to be told to keep quiet. He's silent by choice some of the time.

At the TRIDENT Training Facility, our job is to conduct not only individual training or sea school type training, but also team, sub team, and ship type training. We use the same equipment for training the individual technicians as we have to train the teams

on the ship. Of interest on the SSBN, we have a 20 percent turn-over of personnel each patrol cycle. We have a significant training impact in order to get the teams ready to go for the next patrol period. Training devices have to be available to train. Configuration management is essential. There is an indispensable need to track the hardware and software changes for tactical equipment in order to tailor the training equipment to tactical expectations.

We have to avoid embellishments, as everyone else has said. Some lesser degree may do equally as well. Accurate or video game type special effects, such as exploding ships -- that's one of the things I happened to see on one of those panels today or yesterday -- may be an ego trip for the programmer, but are not necessary for training. It probably takes up valuable space in the computer, and it costs money. A puff of smoke might do just as well.

Training devices have to be easily used. Other people have said the same thing. There is also an increased requirement for part task trainers. Some of the Army and Air Force people were talking about the same thing today. An area we forget about, at least in the submarine force, is the intermediate level maintenance training. It is not very well addressed. There is a need to shorten the prerequisites for the intermediate level technician to obtain the capability to do his job. Right now, we're putting them into a sea school course that might take them a year and then we have to train them from there. It's a very long training pipe-line and very expensive.

It's not cost effective to train to the highest level possible. It's difficult to determine what is acceptable, and therefore imperative that development time for the devices be short. I've seen in a lot of the things we've had, we've made a determination what should be done, we've extended the development time so far that by the time it got back to the user, he forgot what he wanted and it's no longer any good. I suggest you get it there in a hurry; they'll use it and it will be the right thing.

We need to keep the training devices as simple as possible. We don't want to have inordinate training requirements to keep the training devices on the line. We need user manuals that are delivered with the devices. Parts especially designed for a one-of-a-kind device -- and we have lots of those in my school -- very difficult to get. If you think it's difficult to get a part for an F-18, try to get a part for a radar land mass simulator. The component has to be sent back to the factory or the factory has to manufacture one. The pipeline goes down for six months while you do that. I can't afford that.

We need to keep the computer language as simple as possible; if not as simple as possible, at least common. I have one set of devices we can't keep operating because we are unable to put into it vital operating parameters that have changed because of the results of some design changes. It should be a simple problem.

Unfortunately, the holders of the special program used are now French and we can't give them a clearance to work on the system. A major redesign and many dollars will be spent to correct what should be a minor problem. It must be corrected to make the device credible and thus used.

We also need an ability to conduct system level maintenance. A need brought about by central computer systems has not been well addressed. How do we get the various technical ratings together to correct a problem in a complex system? A fault in one of the interfaces is not manifested in black and white means. Software and hardware appears to be complex enough to limit the ability to accurately pinpoint a problem. Why else do we need to spend so much time debugging systems before they are workable? And we only check a small portion of each of those systems when we debug them.

Tactical equipment that is embedded with training unique software in the training area makes changes doubly difficult. Major revisions to the software in the tactical system must be completed prior to undertaking any change in the training area. The operational desire to get the tactical revision to the ship leaves little time to bring a trainer to the desired configuration in order to train the crew for the next new system.

Captain McHugh

I purposely asked the panel this morning to keep their introductory comments as brief as possible to allow as many questions from the audience as we could today. We have a couple of ladies in the audience with microphones so everyone can hear your question, so if you would please, if anyone has a question that you would like to direct to the panel, and if you would like me to assign the person to answer or if you would like a particular person to answer, please say so. At this point, I would like to point out that in the packet that you received, the Naval Training Equipment Center put a forecast of what we've done, what we're planning to do in the future as far as trends in training devices. The training devices that we are handling here at NTEC appear to be doubling the inventory of the Navy's total training devices by the end of the 1980s. That's doubling what we have out there starting in 1980, just a couple of years ago. A significant rise in major training devices and the complexity of the additional training devices is going up rather remarkably. . . . . It's doing that to stay abreast of technology. This last year we had a banner year; we delivered 68 major training devices to the Fleet and of those 68, 9 were major modifications. From that point on, we start looking at the POM process through the next five years and we're leveling out to about 35 major training devices per year out through 1988. That's about as far as we can project at this point. So there is going to be a lot of activity in training devices.

At this point, I've given you a little opportunity to think about your questions, so if there are any questions from the audience please raise your hands and I'll try to call you out.

<u>Question</u> -- (Cannot be heard)

<u>Captain McHugh</u>

I think performance measurement, of course, could be addressed probably a little bit different, maybe the same way in different communities. Admiral Furlong, would you like to address it from the aviation standpoint?

<u>Rear Admiral G. M. Furlong, Jr.</u>

Of course, it's a very difficult thing to do but a very desirable thing to do, to get some performance analysis and equivalency out of it. In the area of air-to-air combat, right now Admiral Fetterman has a trainer at Oceana which pits one flight crew against another, as the ultimate as far as performance evaluation because if you lose, you really lose. We are always looking for a better way to get that equivalency as long as it doesn't drive us into more sophisticated, more complex, and, as I say, normally less reliable trainers. It's according to what technology is going to be able to provide us there, as far as what the trade-offs are and whether they come out on the positive side. I'd pass it on to Jack, because they have been deeply into this with the new twin dome trainer.

<u>Rear Admiral J. H. Fetterman</u>

We've found that it is a benefit, prior to putting the fighter pilot into the air to go against the actual aircraft, for them to work that dome trainer, not only in the air-to-air business as far as another aircraft but in just straight gunnery patterns, for him to get the visual perspective. We save a lot of time when we get them out there. Another area that popped up there when the question was asked, probably the first one, the night carrier landing simulator, when we introduced that one many years ago now, and what it did for our pilots. That's another one hard to measure, but we put pilot classes through those hops on a night carrier simulator and then other classes, of course, went right to the field for their work-up, and who performed the best when they got out there. Well, it comes out in spades, of course, that the guy who goes through the simulator <u>and</u> the actual field carrier work-up comes out better, not only mechanically, but he gets more mentally-attuned to that scene and what he's about to see when he gets out there, so the confidence factor goes up and he performs better.

<u>RADM Furlong</u>

We're in the process of developing a program right now to put two classes together in the area of instrument training and orient one very heavily to the simulator portion of the syllabus and the other to actual flight portion of the syllabus, and track them as they make their way through the training pipeline and out into the Fleet for at least a year or two and see if there is any considerable difference in their ability to carry out their mission once

they get into the Fleet environment, because that appears to us to be one of the areas where we can drive more toward, for instance, what the airlines are doing right now as far as instrument flying is concerned. There are three areas where we see flight simulators in particular, where I see them, playing a larger part. One was mentioned earlier -- electronic warfare. That provides us the ability to train against a threat spectrum which we are incapable of producing otherwise. We can't put a full EW environment out there each time we want to train students in real time. We can do that with simulation very effectively.

Carrier training is another very effective way to go. Of course, we've been doing that for some time. The other one is the thing that many of you have heard of -- the outer air battle, where we have scenarios that are very heavily ECM-oriented, electronic warfare oriented, and where we're talking about large numbers of forces, both surface and air, we don't normally call up those kinds of forces except in a major fleet exercise, such as Clint gets involved in on occasion, and even then, the numbers and the complexity of the types of scenarios we are able to generate are not always to the level that we would like to see them, in order to be an equivalency to the threat. Of course, that's the ultimate.

The other one is the fact that we're different than the Air Force, for instance. When the Air Force forward deploys, they have some very fine training facilities available to them in the form of electronic warfare ranges, air combat maneuvering, or ACMI ranges, other ranges that are dedicated to keeping their readiness at a high level. When our air wings deploy, all of their training assets basically stay behind, except for the carrier, and our ability to maintain a very high level of readiness as far as the ship is concerned is very good. However, many of the other mission areas begin to fall by the wayside because we don't have electronic warfare ranges, we don't have air combat maneuvering ranges, we don't have air-to-ground ranges always necessary, so if we can provide simulation in those areas to go to sea with us, we'll be able to do a better job, I think, of meeting our mission requirements and keeping a higher level of readiness.

Captain McHugh

I think that everybody is realizing that the trend in the surface community is going more and more towards an organic capability to take to sea, which I think will demand more performance measurement when they do get to sea. Maybe Admiral Taylor would like to make a comment regarding performance measurement regarding the surface community.

Rear Admiral C. W. Taylor

You asked a question about performance measurement. Before, we did not have a capacity or the capability to measure performance when

we were doing it using the Monte Carlo type of an approach to any training game or whatever. Now, the computer has given us the capability to do this, and the future, as we develop battle damage assessment in terms of a game or whether you're talking about the air-to-air combat or you're talking about a one-on-one play using the NWAG or the NAVTAG where somebody is playing against someone else, you can measure these things and it can be programmed relatively easily into a sequence measuring the envelope capacity of the weapon that you're using. In other words, if you're talking about a CRUISE missile from a Soviet patrol boat or a CRUISE missile from an ECHO TWO type submarine, or you're talking about a CRUISE missile from the . . ., you can certainly measure that envelope and you can come up with an adequate PH or PK that would give you battle damage assessment if you have the probability of what that's going to do when it comes into your battle group. Now, how you do that and how you set up parameters of what is the best hit-kill probability of any type of weapon based upon what the intelligence community will give you. When the intelligence gives you that 70 percent probability, you crank that right into your computer so that you can have that type of a probability for performance. Now, you take the envelope of how that weapon is supposed to work and you apply whether it's going to fly an L-range trajectory down at you or whether it's going to fly a quiet or mid-range guidance and you add those things into it, then you can come up and measure the performance readily.

Now, there are other things that can be given, too. Certainly, we're doing a lot of remediation in the Navy. Seventy percent of everyone who comes into the Navy is getting some form of remediation and that's a fact. Now, those people who are coming in and using the computer or simulator or whatever you want to call it, we do one heck of a lot of performance measuring in people in basic skills as they come along, and we're just now getting on that bandwagon. We're just now learning about computer aided learning and we're just now starting out to try to capitalize on this very, very open field that no one really has a handle on within our own public education communities -- 17,000 school districts in this country going in 17,000 directions -- and we have a big thing on trying to educate our recuits, our . . . students, and the people coming into our schools.

So, the only thing I'm going to say is the computer is giving us the capability to measure performance, whether you're talking about the type of an envelope in a wargaming situation, whether you're talking about multi-battle groups, or one-on-one playing in a NAVTAG situation, or you're talking about a person who is sitting in front of a computer to learn to do one of the six basic trigometric functions or learning to read. Getting them up to the level where they need to start their school.

Captain McHugh

John, would you or Sam like to add anything for the submarine community?

Captain Ward

Well, in terms of performance measuring in the battle readiness aspect, which I think, Dr. Anders, you at least have some minor interest in, we do that to some extent with our SSBN force in that they are training without the ship for a good period of time before they go over and take over the ship, and part of the process of their final preparation are a series of tactical warfare exercises conducted in the attack centers where there are attack parties, there are sonar parties, and in an integrated manner are both pitted against targets that are operated by the instructors in an inter-active basis, and we are also able to do that by pitting them against another ship that is sitting in another attack center. . . . . for these particular crews, they can't fly away until they adequately demonstrate their ability to, to put it bluntly, kill Commies. That's what they're supposed to be able to do in that particular area. They are also evaluated in a go/no-go basis with regard to their ability to handle casualties associated with the missile systems, the navigation systems, and so forth, that would either make or not allow those missiles to go when they are told to do so, including a set of complex count-downs. So, shore-based training does a master-ful job of aiding that particular area and keeping those people on step and assuring that they're on step before they leave for their actual ships. However, I will state -- and Admiral Taylor, I am sure, will recognize this particular need -- when the crews get to the ships they are worked over by the deploying squadron before they actually deploy to ensure that they can do this on the ship. This is where the rubber meets the road business. We have not come up with a technique in the submarine force where we can say to ourselves, "they did it okay in the simulators and therefore, they can go off to war or go off to do whatever they have to do." We still have that jealous feeling that we want to see them demonstrate it in the actual environment they live in before we're ready to certify that they're ready to go off and do whatever mission they're required to do. Therefore, all of our units that deploy are looked at by other in-spectors in the various environments and displaying the various skills they have to display in a rather non-computer-oriented manner. We have not yet been able to link the computer into that effectively. We probably could do that long term, but I think that we have a lot of other more important fields to plow before we can bring the com-puter into that evaluation technique.

Captain Sullivan

We're able to do a very good job in individual and sub-team areas to evaluate people. When it gets into the more subjective areas, it gets to be very difficult to come up with, first of all, a scenario that will work and that precludes the commander from mak-ing any decisions. Once we get the ship moving in one direction or another, everything else is predicated on that and it gets very dif-ficult, other than the subjective area.

Captain McHugh

Again, in the training world, you've got a very structured course of instruction for most of the people going through and, of course, the Chief of Naval Education and Training is now moving towards the CMI tracking of people in the training programs. Maybe you could address performance measurement.

Captain Dickerson

One of the things that I talked about, the learning transfer would be a performance measurement -- how much of that learning is transferred to the real weapon system. How do you determine that and where do you look at that finite curve in visual simulation of what's enough and what's too much, and what we're talking about in that extra 10 percent. Do we really need it? In naval flight training, of course, we have the advantage of running groups through the training system as groups and one of the things that we're trying to do is the performance measurement of the motion simulator versus a no-motion is one. Our testing is to run a group through a motion simulator and see how that learning skill transfers and one with the motion turned off is an example of a performance measurement that we're trying to get a handle on. Performance measurements in the category of testing or of bringing a pilot aboard ship are very subjective and are subject to human error, but it's not black and white, as you can see. I think this is the closest that we will be able to come to defining our needs a little bit more in flight simulators is to control groups.

Comment

Can I interrupt, Jack? I'd like to make sure that the people understand what we're talking about. There's a difference in computer managed instruction and computer aided instruction. Now, he's talking about aided instruction and that's not managed instruction. Managed instruction, as you well know, is strictly the administrative management of an education system. It has nothing to do with the learning process.

Question

I'd like to address and ask a question of Admiral Furlong. It's been an interesting year as an aviator, sir. We've seen two air wars here, one down in the Falklands and one over Lebanon, where the guy with the least sophisticated equipment won in both cases. I'd like to know what your feeling is on how that happened, what percentage of the success was attributable to training, and what are the implications for us.

RADM Furlong

You say the gent with the least sophisticated equipment won?

Comment

Yes, sir, from a prime item of hardware standpoint. In Lebanon
you had F-4s that are 27 years old and in the Falklands, you had
subsonic Harriers knocking down Mirages.

RADM Furlong

Well, I have to turn it around and say that in fact, we're talk-
ing about the victors having the most sophisticated equipment that
was available. In the case of the situation over in Syria and
Lebanon, we're talking about a very dedicated, very well-trained,
highly sophisticated Israeli defense force, very integrated defense
force, using E-2Cs, and they have four of them, that were strategic-
ally positioned; they were used to the maximum of their ability in
that environment. On the other side, the F-15s and the F-16s were
positioned right where they wanted to. They showed us an awful lot
in the area of remotely controlled vehicles and how to use them in
a tactical war. There were a few new lessons there. In the Falk-
lands situation, as far as I can see, we didn't really learn any-
thing new. We learned once again that if you're going to go into
an area where the other guy has the potential, at least, for main-
taining control of the air space, you better have some airborne
early warning of one sort or another or some kind of early warning
or you're going to make yourself susceptible to systems that other-
wise would be nowhere near as effective as they were. As you know,
the Argentines were using a less than state-of-the-art CRUISE mis-
sile. The platforms that they were firing from were certainly
less than the state-of-the-art. I think the Brits did a magnifi-
cent job with what they had and they had a fair share of luck, as
well. They showed us a lot as far as what a VSTOL can or can't do
and what a small carrier can or can't do, but technology in both of
those cases and ingenuity, I think, were at the forefront on the
side of the victors.

Question

May I address this one to Admiral Taylor? As a member of the
surface community, the procurement and acquisition of new and modern
systems which are increasing in complexity and increasing in relia-
bility gives me a tendency to think that skills learned in training
-- there will be a period of time when they'll never be used onboard
ship and the loss of those skills -- what is anybody thinking on how
to maintain maintenance skills with systems that have increased re-
liability?

RADM Taylor

Well, your perception is certainly valid. The surface warfare
community has come a long way in terms of operator and maintenance
training and simulation. Certainly, the surface warfare community
is behind the power curve when it comes to seeing what has gone on
in the past in the aviation, aerospace, and submarine communities.

We really are lagging behind. But that's no longer true. I think for the first time what has happened over the last couple of years, the surface warfare community has come on very strong. Since 1975, when the surface warfare community was actually put together, a lot of things have happened. Now, under the sponsorship of OP-03 and in particular with OP-39 and with the cooperation of OP-35 working together, we have, right now, a package that is in the POM and we have dollars that are going to be spent in the development of a concerted surface warfare training apparatus, devices, over the next five to ten years, based upon and hopefully we're not going to re-invent the wheel of what we can gain from the aviation and sub-marine communities. Now, this is very important. It goes back to something Admiral Fetterman said in his opening remarks that we have to have growth and we have to have commonality and we have to have something that the person out there who is on the front line can use. You're absolutely correct -- we must have operation and mainte-nance trainers for individuals. We're doing that. Certainly, it's much cheaper and a lot more safe to have a piece of equipment that's a simulator that looks like something that is in the real world, particularly in the electronics or the avionics business where you don't have somebody who can potentially get hurt very badly from a shock, he or she can make a mistake as they fool around with pulling out printed circuit boards or what have you, and exchanging those and going on. Undoubtedly, the AEGIS system that is coming down right now in the cruiser, TICONDEROGA, has a maintenance fault-finding system with the . . . that is part of the AEGIS system. We're having the other things like that are coming along that we will provide training for individuals, NASW, NAAW, in maintenance as well as the operator training and we will take them and put them into the ship.

I don't know if you were alluding to it or not, but it is cer-tainly a known fact that when someone goes through A school, we've really given a heck of a lot of effort in work, and what happens to that kid when he goes through an A school at Great Lakes and then four months later he ends up aboard ship and he says, "no one ever taught me how to do that." Now, there is a very hard line here that there is a regression. People do forget. You can find people who go through BE&E, and I have sat in BE&E in Orlando, in San Diego, and in Great Lakes with individuals. I have followed a couple of those individuals to where they have come to the Fleet and where their performance has been checked down at the D&S piers in Norfolk, for example. There is a regression, so you're correct, and we are considering that in the surface warfare community and trying to pro-vide training devices that we can reinforce and reinforce and rein-force those skills so that when the individual is introduced into the work center, he or she will be able to perform correctly.

Now, what has happened this year for the first time in surface warfare training group community is that we have a consolidated plan that is the same for the Atlantic Fleet and for the Pacific Fleet, that is going forward in the budgeting process. Let me tell you, that is a big one. That's a big plus. We're looking forward

to the future and what you're saying is absolutely correct. Your perception is right on the money and we hope that we can provide those devices to give the simulation and maintenance training that we can pick up from what has gone on in the PMS and the aviation community and the submarine community. We have a lot right there that all we have to do is pick up and tailor it to our own needs.

Question

Would the panel address what you consider are the Navy's needs in biological and chemical warfare defense?

RADM Taylor

It is a hell of a problem and it's something that we've been out of business on, as well as the business of the nuclear warfare area for 25 years. We have ignored it and it is a real problem. We have stated it as a requirement and we are working in concert right now to come up with some of the items that may give us a better defense than what we've had in the past. One, we make everyone who is going to Fleet Training Group Guantanamo or goes through the Fleet Training Unit at Little Creek -- they must get gassed. Whether you're the C.O. or you're the lowest fireman recruit or seaman onboard, you get gassed. We are emphasizing the business of gas mask training. As Admiral Fetterman said, in the Red X, not only did we try to implement gas and the wearing of their masks, we actually had Marine airplanes fly over and spray a chemical agent on the ships in such a way that everyone would have to go through the simulation of a biological agent. Now, what we have done there is that last year we went to the people at NOL White Oak and we asked them to come up and give us an agent that could approximate the density, the volatility, the . . . . Now, it's a fact, and they mixed it with the right proportion of glycerine and a little water so when we put it in the ship, if they don't do a good job it smells like a high school locker room. We are doing that. Also, we are working very hard to get some decent clothing. The clothing that we have that is in our ships that would be used either in a biological or a nuclear environment is very poor. What we need is something that is waterproof, something that is charcoal impregnated, and that will give us the best that we can do. I used the word biological and I should have used the word chemical. We really don't have a handle on biological because it's too hard. We don't know what to do and if there's anyone in this audience that can give us guidance or direction on what we can do in terms of biological warfare, you can really do well for yourself and your company and your country. But we are trying to get a handle on that and are working in that direction, and any type of simulation that we can do, we will.

Question

. . . .increasing the readiness for the military, but others pointed out this zero sum gain that military acquisition money cycle goes through. If there is to be more money for training

technology, including the people who support it, what do you give up?

RADM Taylor

Well, you give up what you've always given up. You give up training and you give up spare parts because it's more important that people will not cut, even though what comes out politically or from the Department of Defense, that they will make vertical cuts, it never happens. Year after year, we take horizontal cuts and so we take a little bit here and a little bit here and the decision always comes down, it's better to have one great big piece of hardware without spare parts than it is to have several pieces of hardware with spare parts and so forth. Training and spare parts, I believe, will continue to be cut and I don't agree with that, but I think that's a fact of life.

Question -- (Cannot be heard)

RADM Taylor

We always say every year that we just cannot do this and we cannot to that, and the guidance comes down that this is the way it's going to be. We say, "this is what we need to have. We have to have so many systems that come along with production, research, and development for training; we have to have so much spare parts to go along to support that; we need to have so many airplanes, so many ships -- but for God's sake, give us the spare parts to support those systems," and then it becomes a decision-making process on the part of people who run budgets. People who run budgets make decisions on budget matters that have to do with dollars and cents. They are not usually the operators, but then in the end, it happens every year and we get our guidance from the Navy Department and we say, "Aye, Aye, Sir." That's how it happens.

Captain McHugh

I think this is a rare opportunity -- if you have an opportunity to get this illustrious group of representation of all the different communities together, so if there are any more questions, please step forward.

Question

Captain McHugh, the panel unanimously addressed the fact that we seem to have a tendency to overstate requirements at the marginal benefit of the extra 10 percent. At the same time, our highly structured system that the development agency uses to develop a device, starting with an MC, a very elaborate document that's well coordinated in our specification development, and in our development process we lean very heavily on our fleet project teams which come mostly from your activities. Often junior officers that are

overworked, a collateral duty, that help modulate the process. How can we get out of this dilemma? Any comments on how we could do a better job as a development agent to not get ourselves in a corner where we're providing that extra 10 percent?

RADM Furlong

I'd take a piece of that one. As I mentioned earlier, you can't ask a fighter pilot if he wants more thrust in his engines, because he's never going to be satisfied with it. Most of our fleet project teams have been made up of very hard charging, very intensive young men who want the best of everything as far as training capability is concerned, and it hasn't been tempered with the years of experience, quite often, that comes with working with the budgetary process or working with simulators, even, to know what you can or can't or what you should or shouldn't ask for. I think we in the Fleet are certainly partly responsible for having allowed this to occur on occasion and some of the trainers we have right now are a direct result of that exuberance to ask for things that are nice to have but which drove these computers into far more complexity than was necessary to meet the training requirements. We just have to do a better job on the Fleet side of balancing out those project teams with both exuberance and experience.

Question

Coming to the budget question again, is it possible that if we looked at further embedding the training capability within the tactical hardware, we could kind of avoid the issue of the large cuts in the area of training devices? I'm talking about the possibility of embedding more devices for onboard training or at sea training in the tactical hardware, thus saving some of the cuts that may exist when they look at spares and training.

Panel Member

Yes, sir. That's one of the parts of the three things I talked about at the very beginning -- that which has to do in a classroom, that which has to do on a pier alongside plugged in stimulating sensors, and the other is the organic training that you can take to sea with you. If you can get it built into the ship construction program in such a way that you have those pieces of equipment that are organic to the ship and part of it, as a class item, we'd be way ahead and that is a very valid perception that you have, sir, and I hope that you and your company can pursue that with a great deal of success.

Question

Going back to the question previous to the one just now, in terms of over-specification of the training parameters, I'd like to get some input from both the surface and the air communities with regard to sonar operator trainers. In the tactical scenarios, I've

seen a quantum jump from three targets to a spec requirement of
21 targets, which increases the number of target sonobuoy links
by 7, and that has been accompanied by a huge increase in the
amount of computer power needed. I'd like to know from the user's
standpoint if that's required?

Panel Member

Did you say 21 sonar contacts he has to be able to link up with?

Comment

I'm talking about -- you can have up to 17 tuned sonobuoys and
this has been a pretty standard requirement, but I've seen the
number of targets in a given gaming area or given mission, the re-
quired number of targets for simulation increase from 3 to 21.
That's a sevenfold increase, and I'm wondering if that's a feasible
training exercise. Certainly, you could have 21 targets, but is it
really that necessary? Does it give you that extra marginal in-
crease in capability?

Panel Member

No. If you have 21 submarines in one area, I'd be out of there
in a hurry.

Panel Member

Admiral Furlong hit it right on the head, I think, when he was
talking about the project teams and certainly, I think that anyone
would have to ask the question -- if that is a requirement, I would
go back and ask again why.

Comment

We do ask the acquisition managers that question, but they say
that you fellows need it. I've talked to test engineers who are
on-site with the simulators and they say that none of the users
say that you need it.

Panel Member

Right. There's a . . . that comes down from Washington that tells
us a lot of things we need.

Question

Perhaps more of an editorial comment than a question. I was one
of those Washington bureaucrats until I decided to cross over the
bar and come into industry, but it seems to me that we in the busi-
ness of training have yet to articulate the relationship of training
to readiness, and therein lies a great deal of the problem in terms
of getting those dollars that we're talking about that we really

need and I wonder if this same question shouldn't be posed to the next group that is made up of staffers from the Hill. I think therein lies a great deal of the problem. Until we can really equate training to readiness, we're not going to have much success in getting the dollars that we really need to do the job that intuitively we all know needs to be done.

RADM Taylor

You are very astute, but I think that what we're trying to do right now in the Atlantic Fleet, and I'm sure similar actions are taking place in the Pacific Fleet, and that is with TACWINGSLANT and TRALANT working together to go out and work against a battle group or a battle force at sea, to define those requirements that we can hammer down and get a doctrine from the . . . Fleet Commander that we can find out what we can do and what we can't do, and then take it to Washington, get it in the POM process, and then get the people on the Hill to support us. Then we can make some type of relationship and a measurement between readiness and what is required in terms of training to get there.

Question

When we talk about the extra 10 percent in training devices, don't we also have the dichotomy of the extra 10 percent in the operational system, which is really taking the training end of things and just switching it around. Our appetites in the operational system are causing an impact on training and that extra 10 percent in the operational system -- how are we addressing that back to the bureaucrats in Washington that the extra 10 percent of operational capability . . .

RADM Furlong

I'll just say right in my end of the business of Fighter/ Airborne Early Warning, we, right now, have the finest systems in the world and we still need improvements in them. We've got a threat on the other side that doesn't seem to understand that we are bouncing head to head as technology goes along. It's counter, countermeasure, counter-countermeasure. That's what's driving the edge of technology right now in those areas. We have got to stay ahead of it, and therefore, training has to stay along as well.

Captain Dickerson

Let me back up what Skip said. The end point to training for me are the evaluations, of course, in our type workup and then we ORE our various air wing and ship combination. We look at that. There's all kinds of areas you go in to see how good that team is progressing. When I measure in the ultimate training, I've got

to go back to the Gulf of . . . -- being better at any given time
on the spot to deal with that threat at that time. That particu-
lar squadron had deployed not too long before that and had gone
through an extensive workup in the 2-E6, the trainer, the air-to-
air. They had gone through a FARP program, which is a Fleet
Air Readiness Program, and gone against adversary aggressor air-
craft squadron that deal in all the tactics up to date, dynamic
tactics, had been well trained, and what happened out there was
a routine type evolution and the reaction was due, in my world,
to being trained and ready to do that at that time.

Question

Jack, I have a quick question for Captain Dickerson. Maybe I
misunderstood him during his presentation, but did he say that
the Naval Air Training has no visual capability in its trainers?

Captain Dickerson

That's correct. We did have a visual capability in our TA-4,
but it became such a maintaining nightmare that we've discontinued
that and at the present time we have none.

Captain McHugh

Let me elaborate a little bit on that. The 2B-35 has been
approved by OPNAV to be removed from those training devices at
this time.

Question

A lot of people always say that the surface, sub-surface, and
aviation people don't talk to each other. Well, quite the con-
trary here today. Not only that, I notice that we seem to enjoy
some of the same benefits of life in maintainability, supporta-
bility, logistics support -- negative benefits, quite obviously.
My question is directed more to Admirals Fetterman and Furlong,
and it has to do with a very small part of their business. They
have very large responsibilities in training and readiness and I
wonder if you feel you have all of the control and authority
over the resources that you require or really need. In other
words, is there some improvement that could come about in your
span of control and authority over training resources that you
don't enjoy at this time.

RADM Furlong

Let me answer first and then Jack Fetterman can elaborate. No.

RADM Fetterman

No, I think anybody who is in the business of training readi-
ness is a frustrated guy, and the closer you get to the problem,

the less control you seem to feel that you have, because you know the needs are out there and when you look at the budgetary process, some of the biggest frustrations that I have are the support facilities to get those airplanes deployed, and those support facilities are critical to making that happen. Our major support bases are just a means to the end, and the end is the aircraft carrier that goes someplace. So we come out second best on the funding all the time on those shore-based support facilities that make it happen. And of course, when the dollar is cut, when the dollar cuts come, we get driven into flight hours and cut back on flight hours and you wind up with decisions of how are you going to train that air crew to X spot that you know you have to train him, with less means to do it in the dollar arena. They can become very hard and complicated decisions to make. So I've taken a long way to say it, but it's a tough game and I feel frustrated.

Captain McHugh

If there are no more questions, I'd like to point out that this has been a very successful -- more or less -- I look at it from the standpoint that the points have been brought out. I think everybody wants less complexity, less software change, and on the more side, it seems we need more commonality, more reliability, more maintainability. Over here we need more performance measurements and certainly we need more and better support. I think one of the questions that came out very clearly from Admiral Furlong is that we need more COMS, more COMS, more COMS.

With that, our time is up and I would like to thank the panel for at least conveying the thoughts of your community to the group here and also to show them that the surface, sub-surface, and aviation in the Navy are a fairly tight group here.

RELIABILITY BY DESIGN AND MANUFACTURING

Captain J. R. Seeley

(Due to technical difficulties, the beginning of Captain Seeley's presentation was not recorded.)

A disciplined approach is the key to design and manufacture of material that works when you want it to and reduces support costs.

It is obvious to me that the American public is becoming more conscious of the quality of products they buy. Television advertising is taking note of this, as these well-known phrases from recent TV commercials illustrate. The American consumer used to look at the label on a product for a "Made in USA" notation and if it was there, was pretty much assured that he was getting his money's worth. Unfortunately, this is no longer the case. Other countries have misplaced America's reputation for quality and there is strong convincing evidence that reputation is helping them and hurting us economically.

Increasing quality increases productivity, which in turn reduces costs and increases profits. Those segments of American industry who understand this equation and how it can influence their return on investments in a positive way, are likely to be much more successful than those who don't. I will deal with this subject a little more later, but the thought I wanted to leave with you is that quality does not have to cost more money. Conversely, it leads to higher profits and a happier customer. All our corporate executive officers must understand how this equation works. I have said that I will be talking about design and manufacturing fundamentals, principles that everyone buying or selling material must be familiar with, at least to some degree. Now, I include in "everyone," corporate executive officers and their managers, designers, production and operations people, contracting officers, program management people and their staffs, both in industry and in government. Understanding these fundamentals is the important first step. Implementing them is another matter. Unfortunately, I've seen professional and personal integrity shattered when the right way of doing things was made secondary to short-range costs or schedule constraints. A climate of integrity must be restored at all levels of government - industry - business relationships. We need to be careful that the outstanding individual that we recognize is meeting cost and schedule milestones doesn't go home and shoot himself or at least flip and go work for someone else, all because he perceived he had to compromise his integrity to be successful.

Someone once said that if you worry about your integrity, your reputation will take care of itself. To me, that's a very powerful statement. Some of you are familiar with the Industry Award Program that our office is sponsoring to recognize key individuals whose personal initiative and innovation significantly contribute to designing and reliability or sustaining the designed-in reliability during production. Integrity and motivation are the cornerstones, in my opinion, for turning this country's reputation for quality around.

In the mid-1970s, the Navy decided something had to be done to improve the reliability of fleet material. Admiral Kidd, who was then our Chief of Naval Material, hired Mr. Willowby who had served so successfully at NASA in the APOLLO and other space programs, and made him his Deputy Chief of Naval Material for RM and QA. Mr. Willowby realized at the outset that Navy Material doesn't have to be as reliable as that used with the Manned Space Program, but that realignment of some of the fundamental acquisition objectives had to be made. Given the responsibility for establishing acquisition policy in this area, he initially promulgated policy memoranda which was replaced in 1977 by the still effective NAVMATINST 3000.1A. Where performance, cost, and schedule were the three primary source selection criteria and program drivers, he made reliability equal to performance. The need for front end funding, required to do it right the first time, is now much better understood. Designed-in manufacturing fundamentals are now being made contract requirements. Boilerplate MIL-SPECs and Standards are now being replaced by tailored requirements, recognizing the uniqueness of every acquisition program.

Testing to proof of design is now done in mission profiles and to the design limits to qualify the design. Lawyers frequently got involved in determining whether a failure was relevant or not. Now it is recognized that all failures must be analyzed.

In production, we now orient our efforts to reducing parts and workmanship defects, and screen electronic assemblies and units to remove as many remaining defects as is economically feasible before the material is shipped to the field. A disciplined approach -- and I want to underscore the word disciplined because it is truly that -- a disciplined approach was put in place not only to improve readiness but to reduce a logistics demand that was truly burgeoning.

Our approach to achieving reliability requirements by design has as its cornerstone one very important principle that must be understood and accepted at the outset. That principle is that stress causes. failure. By the word stress, I include environmental factors, such as temperature, vibration, shock,

pressure, humidity, other factors such as voltage, current, power, chemical reactions, electrolysis, friction, and last but not least, time. This list is not all-inclusive, but these types of factors which we collectively call stress are the causes of failures. Besides stress, then -- and this is important -- there is no fundamental law that says something must fail. It follows that defining the stresses a design will be exposed to in its operational environment is extremely important. In fact, we often call this the first critical step in design. The design engineer's job, then, is to design out stress or to reduce stress levels sufficient to achieve specified reliability requirements.

There are design tools and analysis techniques to help an engineer in this important process, many of which are now becoming available using computer aided techniques that our previous speakers here today have talked about in simulation equipments for training devices. Many prefer to proceed from this point, though, directly into testing. It is often, if not nearly always, more efficient at this point to take a look at what I'll call the dark side of a design. Rather than assuming the design is error-free, looking for its weak spots is an important, necessary step. The alternative is a relatively more expensive test and fix program that all too often gets cut short due to schedule and cost considerations.

The final phase is testing to prove the design. This used to be _the_ major effort. It is important, but must be considered only one part of a disciplined approach to designing in reliability. We can no longer afford to keep our fingers crossed when we throw the "ON" switch to see what happens.

This slide depicts in an over-view form, now, our basic approach to designing in reliability.

Now I would like to talk in slightly more detail about both our design and our manufacturing fundamentals. Now, every good design engineer understands the design approach and follows the basic steps I've just described. But the right business relationship has to be in place so he can be permitted to do his job. That means putting key things in the contract. Make sure reliability requirements are specified. Don't confuse the designer with a reliability goal. He'll set his own design goals to meet the requirements. Consider incentivizing the contractor for a reliable design. Make the design fundamentals you see here incentive evaluation factors. Evaluate them by reviewing contract deliverables and doing design reviews. A contractor whose fee increases by doing the job right the first time will be motivated and in a better financial position to compete in the job market for the top engineers.

As I have already said, now, the first critical step in design is to understand stress because stress is the cause of failure. This understanding comes from a fully-described mission profile, both environment and life. A sonobuoy, for example, can't withstand the forces in the rifling of a gun barrel, nor should the electronics in our smallest projectile be expected to operate around the clock for weeks at a time like a radio receiver. Even expected shelf life is a most important input to design. Believe me, this is equally important in our training devices community. I've heard too often that training devices operate in a benign environment. Ladies and gentlemen, there is no such thing. I've never seen training hardware that wasn't exposed to a lot of stress. It's up to you to define it and to design it out.

A simple design can have many positive ramifications. It is less likely to have as many manufacturing defects; it should cost less to produce; it should be easier to maintain; it probably will have fewer types of spares, reducing support costs; and can be more reliable if these design fundamentals are followed.

A design must be producible. Now, I built up the egos of the designers in the audience so far, but here is what has historically been the biggest complaint against that high-priced engineer. If his design isn't producible in the quantity of production envisioned for the end item, it would have been better if he had stayed home in bed. If the designer doesn't keep himself abreast of the latest manufacturing processes and techniques, the latest information on capabilities and limitations of the materials which will be used to fabricate the design, and the latest in inspection methods used in manufacturing, then he'd better well have a manufacturing engineer sitting beside him at most every step in the design. This seems to be a difficult task to implement in a practical way. Making the design producible, however, is a most important consideration and clearly the design engineer's responsibility.

At the risk of possibly deemphasizing some of the analysis in the design tools I've listed in this slide -- and that is surely not my intent -- I will, in the interest of saving time, only mention a couple. A company who has established rules that include the rating criteria understands designing in reliability. Operating electronic circuit components, bearings, hydraulic fluid, whatever, well below their rated specifications have a chance to operate reliably. They can typically handle the above-rated transit conditions and are much more tolerant of their own imperfections when derated. An anecdote to illustrate this point -- my Dad used an axe with a taped-up, cracked handle for 20 years. As a teenager, I was told to chop some wood and I broke that axe handle on the first blow. The metal handled axe that I was allowed to use after that made me

perspire more, but it didn't break. That was my first exposure to derating -- a derating axe handle.

As most of you know, high temperature is a big enemy of reliability. The reliability of a semiconductor device can be more than doubled just by reducing its operating temperature 10 degrees Celsius. Navy policy is to permit no semiconductor junction temperatures to exceed 110 degrees Celsius. We are even considering lowering that. Meeting the design requirement really is easy, as far as temperature is concerned. Every customer who buys electronic equipment should, as a minimum, ask if a thermal survey was performed on the equipment to obtain an understanding of where the hot spots are. If many of the junction temperatures exceed 110 degrees Celsius, I would leave it sitting on the shelf. This includes training devices.

Here is an illustration of the reliability improvements made to the Ark-182 radio set by Rockwell International, using design analysis tools, 233 of them by doing a thermal stress analysis alone. Now, I've talked quite a bit about designing in reliability because it's so important, but so are the manufacturing fundamentals.

Every factory's manufacturing rules should cover these fundamentals to sustain the designed-in reliability in production. The first step is making sure you have good materials and you have separated the bad parts from the good. Most of you have heard about the bad steel that got into our submarine construction program and the cheating that was recently uncovered by some of our big electronic piece part manufacturers. Since it costs so much to get a part out in each higher level of assembly of a manufacturing process, many companies, both in the military and the commercial markets, rescreen 100 percent of their semiconductor devices at incoming inspection. We have made this a Navy standard procurement policy.

Too many manufacturing operations try to achieve quality requirements by inspecting the material and fixing the defects only. All this rework and scrap we call the hidden factory costs. If all the corporate executive officers knew what their hidden factory costs really were, most would be aghast. Adjusting the manufacturing process in a conscientious way to minimize defects not only increases productivity and profits, but improves quality of the final product, as well. Producing defect-free products is a valiant objective that most now agree is an impossible one to obtain in the real world. In recent years, industry has learned a great deal about methods to stimulate electronic assemblies and units to find part and workmanship defects. With industry participation, our office issued a document called NAVMAT P-9492 in May of 1979 that provides guidelines for conducting thermal cycling and random vibration. In 1981,

the Institute of Environmental Sciences, a professional society, issued their own guideline for screening out manufacturing defects. It verifies that temperature cycling and random vibration is the most effective types of screens for electronic assemblies and units. The issue is now becoming not if manufacturing screening should be done, but first what are the most effective levels and second, how can these defects be more efficiently analyzed to further adjust the manufacturing process which minimizes defects, further increasing productivity, profits, and quality.

Now, this may sound like a lecture, and lectures given in the middle of the afternoon are one of the most soothing ways I know of to put people to sleep. But lectures remind me of the best professor I ever had in college. He would put a 3% mark on a blackboard beside those points that he insisted we remember. Now, I won't try to summarize 100% of what I've said, but this slide gives you that 3%.

First of all, get contracting officers involved in contracting for reliability by helping to establish a good business relationship. Specify reliability as a requirement. Use contract incentives, and use design and manufacturing fundamentals as a source selection criteria.

Second, define the stress your material will experience in its operating environment, and then design out that stress. Use analysis tools to check your work. Then test to proof the design.

Before starting the fabrication process, be conscientious in separating the good parts from the bad. Control that process to minimize defects and those all-too-often enormous hidden factory costs.

Finally, subject the final product to a screening test that stimulates part and workmanship defects.

Of course, it's important to consider reliability and quality in our space programs onboard our ships, our tanks, our airplanes. But it is important to consider them in everything we build in America, including training devices. I guarantee the results of this disciplined approach will mean higher productivity, higher profits, higher quality, a happier customer, and a happier producer. I challenge you to maintain your integrity. If it's right, do it; if it's wrong, don't.

Good luck.

PLENARY SESSION

CONGRESS AND MILITARY TRAINING EQUIPMENT

Mr. Gary W. Morton

. . . . from the Executive Branch of Government and predominantly from the Department of Defense. This panel, in my memory, is the first formal participation of compatriots from the Legislative Branch. In this regard, maybe the question to be asked is not why is this happening, but perhaps why has it taken so long for this to happen.

Our speakers in the last two days have addressed the tremendous growth, not only of this conference but even more importantly, the tremendous growth in the application of simulation technology to military training requirements. We within DOD certainly take pride in our contribution to this growth and the cost and training effectiveness that has come along with it. I think we must be fair in our historic perspective and recognize that there have been times in the past when segments of DOD have been somewhat reluctant to expand the use of simulation in certain areas. At those times, it was Congress and individuals such as Senator Goldwater and the staff people who supported him, who nudged the Services -- sometimes gently, sometimes not quite so gently -- to expand the use of simulation. So our community does, today, owe a thanks to our Congressional compatriots for their help in bringing us to the place we are today in terms of the application of simulation in military training. I think it's particularly appropriate that we have with us today to be our panel moderator one of the key Congressional staffers who directly supported and contributed to the expansion of the use of simulation. Mr. Robert Old first came to the Legislative Branch in 1971, after 25 years of military service as an Air Force pilot. At that time he joined the staff of Senator Peter Dominic as a Special Assistant for national security and civilian aviation issues. But his most significant contributions began in 1973, when he joined the Senate Armed Services, first as a Professional Staff Member, and then from 1977 to 1979, as a Republican Staff Director. It was in these positions that Mr. Old materially and positively influenced the simulation and training programs of our Services. Currently, Mr. Old serves as President of his own consulting firm, Old Associates. But before I ask Mr. Old to take over the session, I'd like to take a minute to express the appreciation of NSIA and the conference committee, both to Mr. Old for coordinating and monitoring this panel and to the Congressional staff members who have taken time out of their very busy schedules to be with us here today.

Ladies and gentlemen, please join me in giving a warm welcome to one of the most influential and knowledgeable individuals in simulation and training today, Mr. Robert Old.

Mr. Robert Old

I think we ought to quit right there; there's no way we can top that. Thank you very much.

I'd like to welcome you to our panel on Congress and military training equipment. Gary mentioned this is a new subject for the conference. Also, the first time, of course, that we've had Professional Staff Members from the Congress here on our conference program. I'm very pleased that they're here. I'm sure you'll find their remarks interesting. While they are here, if the opportunity permits, we also want to be sure they learn as much about our business as possible.

Let me introduce our panel members and then I'll explain the rest of our format. First, from the House Armed Services Committee, Mr. Anthony R. (Tony) Battista. Tony received a Bachelor of Science degree in mathematics and he has a Master of Arts degree from the University of Oklahoma. In 1963, he was employed as an aerospace engineer with the Manned Spacecraft Center in Houston with NASA and he formulated and developed a significant part of the Command program for AEGENA, GEMINI, RENDEZVOUS manned space flights. From 1964 to 1974, he served with the Naval Weapons Laboratory at Dahlgren, Virginia. He held the position of Supervisory Mathematician and head of the Guidance and Control Division. Tony then was appointed as a Professional Staff Member to the Committee on Armed Services, United States House of Representatives on January 21, 1974. Please welcome Tony Battista.

From the Senate Armed Services Committee, Mr. Carl M. Smith. Carl has a Bachelor of Arts degree in economics, which he won in 1970 through NROTC at the University of Virginia. Following graduation, he entered the Navy's Flight Training Program, designated a naval aviator in October 1971. He was an A-7 operational pilot, completing three operational deployments aboard the aircraft carrier USS JOHN F. KENNEDY. He served on active duty for eight years, then accepted a Reserve commission and entered the Georgetown Law Center, where he is completing his Juris Doctorate degree. Carl joined the staff of the Senate Armed Services Committee in June, 1980, and he is currently the senior staff member responsible for tactical warfare, the committee which Senator Barry Goldwater chairs. Please welcome Carl Smith.

From the Senate Appropriations Committee, Mr. Fred W. Rhodes. Fred has an extensive background with the Government. He entered the United States Army in 1953, where he served for three years, and after leaving the Army he was employed by the Central Intelligence Agency, where he served for two years. He then went to private industry for a short while and then came back to the Government with the Department of the Air Force as a budget and programs cost analyst, where he served for 11 years. In 1973, he was appointed as a Professional Staff Member of the Committee on Appropriations, United States Senate, where he serves, at this

particular time, with the minority, serving with the Democrats. He hopes soon to be with the majority. Please welcome Mr. Fred Rhodes.

Let me turn now to the panel format. First, each of our panel members will tell us about his specific committee responsibility and general attitude of his committee on DOD requests for training equipment. On a broader scale, I have also asked each of our panel members to discuss the highlights of his committee's action on the FY 83 Defense bill. For example, Tony and Carl spent a number of hours across the table from each other earlier this year negotiating for their committee's position on various programs that were in disagreement between their committees. Perhaps they will share some of these experiences with us. Second, after each of our panel members has completed his statement, we will then proceed with questions that explore a number of areas that we believe will be of interest to the conference.

Then, third, after the presentations, the panel will accept any and all questions from the floor as time permits, provided you stand up, completely identify yourself, give your name, rank, social security number, the company for which you work, current programs before the Congress, etc., etc. Face the television camera so you can be properly identified.

Then finally, each of our panel members will be given time to make closing remarks if we, in fact, have enough time. So at this time I'd like to turn the floor over to Tony Battista, Professional Staff Member, House Armed Services Committee.

Mr. Anthony R. Battista

Thank you very much, Bob. I'll try to follow your outline here of first explaining what I do with the House Armed Services Committee. I'm with the Research and Development Subcommittee. There are two of us who work Research and Development -- Tom Cooper, who you may have heard of, and I -- and in that account we've got 3,500 projects, representing about 800 major program elements, and it encompasses virtually every discipline, from anti-submarine warfare to satellites to computer sciences to irradiated foods and you name it, as far as DOD technology goes, and basically Tom and I take a look at it.

I'd like to comment a little about the particular role of the staff. We're often accused of micromanagement, to which I respond that we'll continue to micromanage until somebody decides to pick up the job over in DOD from time to time. But we on the staff have about as much power and authority as the Chairman, the ranking minority, and the members decide to give us. We are not organized in a majority/minority fashion, as many of the other committees. I do as much work for the Republicans as I do for

the Democrats, and sometimes more, depending on who's got the particular interest at the time.

We're accused of making decisions. We don't make any decision that we're not empowered to do at the request of the Chairman. By and large, 99 percent of the decisions made in our committee are made by the members of the committee, the other 1 percent being determined on the floor of the House. If they ask us for a recommendation, we provide it. Tom and I serve primarily as data banks, and we're there on call to answer, to not only recommend reductions for programs but to in effect defend those programs that need defending when the Service witnesses go home. For example, it wasn't too many years ago that I sat before the R&D Subcommittee for about 3 hours, going through one complete volume of Army programs, justifying the increase beyond 10 percent of every program in the Defense Research Science and Exploratory Development Account for a particular member. So we have to pick up the ball and not only make recommendations and adjustments on the negative side, but also defend the Service programs when all the witnesses go back to the Pentagon.

Bob, you asked me to talk a little bit about the Committee's view and my personal view about simulation and training programs as they are presented to the Committee, and I have to deliver some bad news to you. There is really no constituency for these programs, just as there's no constituency for providing spare parts for our needed weapons systems, our fielded weapons systems. It is a problem -- simulators, trainers are often misunderstood. There are some members of Congress who believe, erroneously, that you can substitute simulators for flight hours. We don't particularly agree with that, certainly at the staff level, and I think many of the members who understand simulators on our committee disagree with that assessment.

As far as training and trainers, again, it's an area that's often misunderstood. We wonder if you're doing an adequate job out there. I just returned from the Eastern Med, for example, and one of the most severe criticisms we got from the Fleet was the format in some of the training schools, the A schools, for example, whereby actual instruction was replaced by programmatic instruction and the complaint we got was, we get an electrician -- an alleged electrician, for example -- out of the schools and he comes to the Fleet and he has never soldered a wire or measured the resistance across a circuit. They were really faulting the programmatic instruction format.

Quite candidly, the only people I ever hear from regarding simulators and training are Bob Old and Dick Eichord, from time to time. I don't allege to be up to speed on all of your programs. I'm pretty up to date on pierside trainers and some flight simulators or the requirement for the EF-111 simulator. I'm aware of

some of the technology, the technological advances; but when you're dealing with 3,500 projects and there's no real constituency for these, no volunteers to come up and tell you what's going on, it makes it awfully difficult to keep pace.

So I would say in closing that I think the requirement, the utility of some of your products out there is not well understood up on Capitol Hill, and you can do a better job in getting across the message regarding the proper use, the proper role of simulators and trainers in our weapons systems programs.

Lastly, Bob, you asked me to talk about my relationship with Carl. We have a very good one. For the two years I've dealt with him, our differences center mostly around my calculator, which has only plus signs on it for DOD programs, and his, which has minus signs on it. In all seriousness, we do get together for many, many days, many, many hours, going over several hundred differences and it will never cease to amaze me how we tend to resolve our differences and I think there's a willingness on both parts to admit that we may have overlooked some facts, we do make mistakes, contrary to popular belief, and our sessions are characterized by very frank, open discussions, whereby there's a lot of give and take. The give is higher than the take, as far as the House position goes, but basically it's a very cordial relationship, and I'll say that there's a lot of conversation among staff people on the Hill. We do talk to the Appropriations people; I've been on panels before with Fred. We talk during the course of the year. Similarly, with Wayne Schroeder, Bob Serafin, and other people. So there's a lot of good communication and I think it ultimately culminates in a better Defense program.

With that, Carl, I guess you're next.

Mr. Carl M. Smith

Thank you, Tony. The Senate Armed Services Committee is structured different from the House Armed Services Committee. In 1980, when Senator Tower became the Chairman, we revised the committee structure along operational lines, rather than the R&D, procurement subcommittee structure that we did have before, which is still the structure of the House Armed Services Committee. We have functional areas now in six committees. I'm responsible for the staff work that's done on the Tactical Warfare Subcommittee, and Senator Goldwater, as most of you know, is the Chairman of that subcommittee. My responsibilities are in both R&D and procurement. What we do is follow a system through a cradle-to-grave concept. We start out at the very beginning of the concept and we stay with it through all the mods until it's finally replaced by something down the road.

As far as the committee attitudes toward simulator programs goes, I'd have to take a a slightly different approach than Tony. We do have a strong constituency on the Senate Armed Services Committee in the person of Senator Goldwater, who, as you all know, is a strong supporter of simulator programs. He, of course, will be the first one to tell you that he would not sit still for flight hours being replaced by simulator hours, but he will also be among the first to tell you that very effective training can be accomplished with simulators, and the trick is to use your simulators wisely to accomplish the best training you can to achieve the highest readiness rates that you can, not to deny pilots flight time.

Senator Goldwater, by the way, is at home now. Most of you know that he had surgery a week and a half ago. He's at home and doing very well. I called his office just before coming here to get an update, and the word is he's feeling better every day and he asked to convey his regards to you all. He will be back for the Lame Duck session in November. We had tentatively scheduled a hearing on simulators for that period, but it looks now like we might have to reschedule it to sometime maybe in January or February, his schedule permitting.

I'd like to pass the mike to Fred now, and leave the rest of the time for questions.

Mr. Frederick W. Rhodes

As Bob as indicated, I am on the minority staff of the Senate Appropriations Subcommittee. I like to categorize myself as not only the senior officer, but the junior officer on the staff. I'm the only one there. I hope that, as Bob indicated, I won't have to say minority very much longer. It's been so hard for me to say that after spending about 8 years with the majority staff.

As the minority staff member -- and the only one -- I am required to assume some responsibility for looking at all of the various appropriations. The President's budget request for FY 83 was $249 billion, so I do overlook the appropriations for operations and maintenance, military personnel, procurement, and R&D. It's a very busy procedure doing this. As far as the Senate Appropriations Subcommittee on Defense, we are structured by appropriation. We have an individual that overlooks for the majority the research and development; another one looks at military personnel; another one looks at procurement, etc.

I'd like to talk a little bit about the '83 bill, where we stand. The Senate Appropriations Committee has reported to the full Senate its recommendations for FY 83 appropriations. We reported a bill of $233 billion, a reduction of approximately $16 billion from the President's budget request.

On the House side, the House Appropriations Committee started its mark-up of the Bill this week, on Monday. It is to complete it this afternoon, but my indication is that Mr. Adabo, the Chairman of the House Appropriations Subcommittee, will recommend reductions of approximately $18 billion, down to a level of approximately $231 billion in budget authority. Now, the Chairman's going-in position was quite a bit higher than that. Press reports had the Chairman recommending reductions in the magnitude of $33 to $34 billion, and I think that indicates that perhaps the Chairman was going in with a high figure, hoping to be whittled down a little bit, or perhaps his subcommittee is a little more about the state of the defense effort.

Some of the major issues that have to be discussed this year in the appropriations process have to be the MX production. Chairman Adabo did go after that. The request is to produce the initial 9 missiles for the MX before the basing decision is announced and before the R&D is completed. It was a very close vote in the House, I am told, and by a vote of 7 to 5, the Chairman did not succeed in getting the funds removed. But he has indicated he will carry his fight to the full committee and even to the floor, and I think this is going to be a major issue and this is something that the Administration is going to have to support very strongly or else it will not go through.

Probably the prime essence of what we have to look at in appropriating funds for FY 83, is the fact that what we're setting in motion today is really going to affect the deficit in the 1984 through the 1987 time frame. When we appropriate budget authority, this is just the full funding of a nuclear aircraft carrier or an aircraft or whatever you have, and we then expend or outlay those funds in the succeeding 3, 4, or 5 year period. For example, a nuclear carrier today costs approximately $3.5 billion, and that $3.5 billion in budget authority is appropriated in the year in which it is approved. It will be expended over the next 5 years while that aircraft carrier is being built. Now, the Office of Management and Budget has indicated that the deficit for the current fiscal year will be in the area of $150 to $160 billion. For FY 84, the upcoming fiscal that the Department is now going through the programming and planning for, there are some indications that the deficit could reach as high as $200 billion, and I think that was part of Mr. Adabo's approach in recommending a fairly hefty cut in the FY 83 appropriations. He felt that he was required to cut some of the large ticket items or else there was going to be an extensive debate over the guns vis-a-vis butter when we hit this deficit of $200 billion plus in '84 through '87.

I believe the Reagan Administration, when it came into office in 1980, thought that the public opinion -- in fact, the

polls at that time showed that approximately 70 percent favored
an increased defense posture. But the latest Harris polls, which
came out just around election time, indicated that that 70 per-
cent has now eroded to about 17 percent favoring increased
defense expenditures. I think that this probably reflects, un-
fortunately, that more and more of the cuts in the social pro-
grams are taking effect around the country and people are look-
ing as to whether there should be the 7 to 10 percent real
growth per year that the President seems so intent on obtaining.

As far as the Committee position on simulators and on train-
ing equipment, the Committee, over the years, has had a very
positive approach on this. The Committee has generally been in
favor of obtaining economies wherever they can and I think simu-
lators and the training equipment is just one more example of
ways to get the job done better, and the Committee has supported
it very strongly.

Mr. Old

Thank you very much for those introductory remarks. We're
going to free-wheel it now and get into some questions, which
will be thrown up on both of the screens, so you'll know what
the question is even though the answer doesn't match what we
asked.

Fred led into the first question, so I'm going to throw that
up. Fred, how about taking the part of what's your estimate of
how much the bill will be below the requested $245 billion and
something about is it likely to be amended to the point that the
President might not sign it.

Mr. Rhodes

Yes, I'd like to just hit that first one about whether I
think we're going to get a bill before Christmas, and I think
it's going to be tough. The Congress returns on November 29th.
There are 15 working days before the continuing resolution ex-
pires. To get that through, it's going to have to come very
fast. I believe it's up to the House leadership to make that
determination. I believe the Chairman of the Defense Subcommittee
on Appropriations fully believes he's going to report that bill
out and will do so out of full committee shortly after they re-
turn. But it's up to the leadership, then, to decide whether
you receive floor consideration and whether the Senate takes it
to the floor. As you know, the Democrats picked up 26 seats in
the House and it well may be that the Democratic leadership on
the part of the House may decide to forego taking that bill
through until they have a more favorable posture.

Now, as to where I think we'll come out from a budget of $245 -- or $249 billion is the figure that we've been using -- the $4 billion has not been requested by the President yet; that is to accommodate the pay raises during FY 83, and will be requested in a supplemental later in the fiscal year, but that's carried in the overall budget request. But our recommendations to the Senate is at the $233 billion level. The House subcommittee is going to report out something in the magnitude of about $231 billion. The current continuing resolution is funded at an annualized basis of $227.5 level, so I would think something in the magnitude of around $230 or $231 is about where I would see us coming out. Whether I think the President would veto a bill like that, in my memory I don't recall the President vetoing a defense appropriations bill, and to get it to a point low enough where he would veto it, I think it would have to go down substantially below the $230 billion level, and I don't think that's going to happen.

Mr. Old

Okay, moving right along to the next question -- you're going to see me skipping some questions here just because we think some are more important than the others. When the Armed Services and Appropriations Committees all include directive report language on the same program, which report is the Pentagon supposed to follow?

Mr. Smith

I think the answer is straightforward. When there is conflicting language, I think they follow all of it to the extent that they can. That's usually the Service approach. Clearly, report language does not have the force of law and can be ignored if the Pentagon should choose, but it's ignored at their peril. Usually the Pentagon is pretty diligent about following that language. When there are conflicts, because report language is pretty informal as a way of effecting legislative interests, because it's informal the conflict is usually handled informally through contact with the staff and contact with key members who have particular interest on two committees with the conflicting language, and usually those are satisfactorily resolved. This year there are several examples where we have conflicting report language. Some of those will take care of themselves as programs fall off or as the issue is overtaken by events. Others will be resolved in the manner that I described. Fred's language follows ours in the law, if a subsequent law prevails over an earlier one with which it conflicts, but that's not true of report language. Report language only expresses the opinion of a majority of the committee; it is not regarded as an expression of a majority of the House or Senate. It only represents the opinion of a majority of that particular committee.

Mr. Old

Okay, let's go on. Some say the Congress does too much directing and telling the Pentagon to implement particular programs' weapons systems. What are the panel's comments on this? I'm going to add a little footnote. Many in industry and the military assert that Congress micromanages many of the Pentagon's programs. How do you respond to these two questions?

Mr. Battista

I'll give a try at that, since I said earlier that we will continue to micromanage until someone in the Pentagon starts. First of all, let's stop and look at the Congressional charter. You go back to Article 1, Section 8 of the Constitution, and it says Congress shall appropriate, raise armies. With that broad charter, they could abrogate as much responsibility as they want to the Department of Defense. Over the years they have delegated a lot of that authority to the Department. I think it became apparent early in the mid-70s that the United States was falling way behind in terms of our ability to maintain our conventional and strategic posture. The Soviets were filling their pipeline with thousands of tanks, aircraft, artillery pieces. Congress, at that point, decided that they wanted to reclaim some of their power that they had abrogated to the Department and see if we couldn't get, as one of my former subcommittee chairmen said, more bang for the buck.

There's no question in my mind that a program has its greatest chance for success if it's an Administration initiative. If the Administration proposes it and there's unanimity of opinion behind the requirement for it, the military utility of it, then it stands a good chance of getting approved in Capitol Hill. If, in fact, there's uncertainty in the Administration program, if they're a little bit wishy about how they're going to do it or what the requirement for it is, Congress intervenes and Congress will make the decision.

There's been a lot of micromanagement in the past, most of which, I think, has resulted in an improved capability. For example, it was Congress, over the objection of the Navy, that mandated nuclear propulsion for our POLARIS submarines and I think it's been a real good thing.

So, I think, by and large, there's an overplay of that charge that Congress micromanages. Congress gives its best judgement and if that judgement is controversial, if there's something wrong with it, then the DOD has the option of coming back and saying, "this is what we think." There's an open communication channel. I don't think there's as much micromanagement as people allege, however. But I will say that when Congress decides to do it, they certainly have every right to do it.

Mr. Old

Would any of the other micromanagers care to comment?

Mr. Smith

I agree with Tony. The set-up is clearly civilian leadership, civilian control of the military. If the bill that came over from the Pentagon were pure, then there would not be justification for micromanagement. But there are many things that go into the DOD request that comes over to Congress which are quite impure and are based on assumptions which you all operate under -- I say you all to those who are in the military -- but we're not operating on the same assumptions. For instance, think back to the years when the Jimmy Carter inflation estimates in the out year were so modest -- 5 percent inflation rates -- and weapons costs were projected on the basis of those interest rates. You were bound to it. You had no choice. Over on the Hill, we could be more realistic and say that the likelihood of seeing those interest rates was just about nil. If you base your ability to fund future programs on those interest rates and assume that there will be money available in the out years to buy weapons instead of just to pay inflationary increases, that money won't be there because in fact that money will be used to pay inflationary increases in other weapons systems. So we operate with different assumptions and therefore, I think are not only entitled, but it's a matter of responsibility to look at the DOD bill from a different perspective. So not all of the micromanagement is nit-picking; I think it's quite justified, quite appropriate.

Mr. Battista

Bob, could I just add one more thing to that? In recent times, the very high speed integrated circuits program, in bringing that technology into DOD, was a Congressional initiative. The medium range air-to-surface missile, which the Fleet told us last month they needed yesterday, was a Congressional initiative. I might point out that there's a lot of input that we get from the field, from the Fleet, input that says they needed something yesterday, or today, right now and the Pentagon isn't funding it, and believe me, members of Congress and staff place a lot of stock in what comes from the guy in the field because he's the guy who's got to go out and fight the enemy. If he says he needs something, a lot of consideration is given to that stated requirement. So in recent times, I think VISIC and MRAS were two very significant Congressional initiatives for which we've been accused of micromanagement. But I think it's been positive.

Mr. Old

Okay, get your sons and daughters who are serving in the
uniformed services to write to the committee about how they need
flight simulators.

Now we're going to narrow this down and get into the simula-
tion business. The EF-111 flight simulator request this year
was about $24 million, which included an R&D line item called EW
Counter-response. Tony's committee zeroed the flight simulator
portion and Carl's committee funded it. The Congress, however,
agreed to $22 million. I'd like to get the story of what was
behind that program.

Mr. Battista

I guess I have it by default. It goes back a long way. It's
not the simulator itself that created the problem. The problem
was created by an Air Force study of several years ago. It was
called SCF-2, and in that study they concluded that the EF-111
was perhaps the least cost effective weapon system to take care
of the massive number of Soviet SAM systems in the Warsaw Pact
countries, and that basically a defense suppression was a far
better technique to pursue, in the form of the precision loca-
tion strike system, in the form of the LOCUST or the RPV. The
feeling was that it was far better to kill the SAM than it was
to neutralize him for a matter of minutes. The Air Force presented
this program. They had some assets in the form of 111s, and they
came to the Hill and gave us a $900 million program. I might
point out that nowhere in the requirement was there stated a need
for a simulator. Within one year, that program went from $900
million to over a billion dollars and it continued to grow. The
Air Force procurement strategy was to procure one kit, I believe
it was, in FY 79 and we asked very facetiously whether it was
their plan to procure one kit a year for 42 years, and basically
how that would enhance our ability on the battlefield. It was
Congress, by the way, who turned that around and put the right
number of kits back in the program. But the program has continued
to grow and the Air Force now has come up with a new threat for
which the system must be enhanced. Now, that new threat that
they came up with in the past 1-1/2 years is the very threat that
we questioned the ability of the EF-111 to handle back in 1979.
So we feel as if they nickel and dimed us, and now they come in
with a requirement for a simulator. Now there are, I guess, three
main points with regard to the need for the simulator. One, do
you really need one for a complement of 42 EW aircraft? Two,
how will it be used in terms of enhancing proficiency? And
number three, why couldn't you adopt a derivative of the EA-6B
simulator to do the EF-111 simulator job? Because remember, the
EF-111 is nothing more than the internal repackaging of the ALQ-
99 system that's in the EA-6B. Now, the presentation is obviously

different in the EF-111, but still, why couldn't you take the ALQ-99 system as a baseline and mod that and save some dollars? We subsequently found out, not through the Air Force, by the way, that this is what the contractor has been doing. But I think there was an absence of candor in one, the requirement for the 111; two, the fact that they never included the simulator in the original requirement; and now they're coming in after the fact and saying, "by the way, we need all of these things to make the system effective." So that's basically the rationale as to why our committee feels the way it does on that particular program.

Mr. Smith

On your first point, whether or not there's a requirement for the system, it's difficult to imagine an aircraft which requires a simulator more than the EF-111. You can't go out and fly over the United States and put out the kind of energy that the 111 does without incurring multiple flight violations and creating havoc in the air traffic routes. So the need, in my opinion, is clear. I'm just grateful that despite the fact that there may have been some poor communication between the Congress and the Air Force in articulating the requirement and articulating the plan for the program, that the House was willing to see the wisdom of the Senate's position on at least that one program and see their way clear to fund it.

Mr. Battista

It wasn't the wisdom -- the conference had to come to an end. We had to do something.

Mr. Old

Well, you gave back most of the money.

Mr. Battista

Yes, that's true. But Carl, I think it's inexcusable that the Air Force, back in 1978, didn't come clean and tell the Congress that in addition to 43 UE aircraft, they wanted a simulator for this thing, too.

Mr. Smith

Well, I don't think that's unusual. If you look back in the history of aircraft programs, it's probably more often been the case than not that the requirement for simulators and the plan for the procurement of simulators was an after-thought to the procurement of the aircraft, and it's only recently that we've developed the concept of procuring a package. The Navy's VTX

program, if we can keep that together, will give us that package. The SH-60 package concept -- but anyway, we're getting smarter about the way we do business, and hopefully, if it was a miscommunication in the past or if it was just an oversight, hopefully we've learned from those mistakes. I think we've done the right thing now with the EF-111. I'm happy to see that it's proceeding.

Mr. Old

Okay, moving on -- because it does get involved with money and we want to have an idea of how the committees feel, is there a dollar limit on flight simulators beyond which you would recommend a program be terminated or restructured, and do any programs immediately come to mind? Everyone hold your breath, because this is the moment of truth in case you've got some programs that are - - - - who will take a crack at that?

Mr. Rhodes

I'll take a crack at it. At least from an appropriations standpoint, I don't think the committee looks at it in that perspective. Really, you have to look at each of the simulators on a case-by-case basis, decide what are they supposed to do, are there any other options that are available for providing the training, what are our alternatives that we can do. As far as I can recall in my history with the committee, and I think with the House Appropriations Committee, also, I don't think there's a finite dollar level. I would doubt very seriously if the authorization would view it that way.

Mr. Smith

We certainly wouldn't. We're more often focusing on the growth, rather than the initial cost of a program. I'd like to think that when the initial cost estimates come in, they're reasonable and have been thoroughly and properly scrubbed by the military. It's only after a program has been in the budget for a couple of years and we see it start creeping up 20, 30, 40 percent increase in cost that we really become concerned.

Mr. Old

On that particular point, now, if a contractor has a program underway and he sees that the costs are going to begin to get out of hand, do you recommend that he come to you and give you a briefing on the problem and alert you to it, or should he leave that strictly to the Service? How do you feel about that?

Mr. Rhodes

From my standpoint, I think we have an open-door policy up there. We see most of the manufacturers at one time or another throughout the year, and I'm delighted to hear at the earliest possible time of potential cost overruns from anyone I can.

Mr. Battista

I, frankly, get rather perturbed when -- for example, during this time of the year when things are . . I don't want to say at a standstill on Capitol Hill, but we certainly have time to go out and investigate programs and find out what they're going to do for us. And we don't hear from contractors; we don't hear from the Services. But as soon as we take an adverse action on one of your programs, and it's during mark-up, we hear from everybody, and we get 400 telephone calls in a week to come in and see us. That's the wrong time. If you suspect there's trouble with your program, don't wait until the eleventh hour. Frankly, I get, from time to time, better data from the contractors than I do from the Services. It's not true in all cases, obviously, but I want to hear your perspective. I want to hear your side of the argument. In many cases, there's reason for cost of growth. We do research and development because we don't know how to do it right the first time, and we learn by our mistakes. But the worst thing, I feel, you can do to a program that's in trouble is to take money out of it. I can only say that I'd like to hear from you in the slow times of our year as opposed to just when you're up against the stops and you're in trouble.

Mr. Smith

I'd like to add my concurrence to that. In my opinion, you can't communicate enough with Congress. It sometimes will work to your detriment and there's nothing worse than being blindsided from out point of view. When a program comes in with dramatic cost growth, it doesn't happen all of a sudden. It builds up over a period of time, during which people are initially suspicious and then pretty sure and then certain that it's going to go up dramatically. The time to start talking is early in the game. If you've got a case to make, if there's a valid explanation for that, that's the time to lay the groundwork, not after it's become an item in the press, and you've got members that are excited about 40 percent, 50 percent cost growth in a particular system and are calling for its demise. The time to do your work is early in the game, and the time to do your work is during the slow period, as Tony says, which is right now. It may be tough to get a phone call through, but just keep trying. You'll find it much easier now than in March and April when the real work is being done.

Mr. Old

What does a flight simulator have to do to justify its existence to the Congress? Does it have to reduce flying time by a certain amount? Amortize itself over a certain period? Or just improve the quality of the training? How does the panel feel about that?

Mr. Smith

Let me start that one, Bob. The concept of reducing flying with the introduction of a simulator is anathema on the Senate Armed Services Committee. Senator Goldwater won't sit still for that for a minute. We're not flying enough as it stands now. We haven't been flying enough for the last 5 years and we simply don't have enough flying hours in our flight hour program. Unfortunately, the Senate Appropriations Committee just cut the FY 83 flight hour program some more, so we have even fewer than we'd hoped for.

What does a simulator have to do? Well, it's got to provide effective training, enhance readiness, and it should also increase safety. The Navy recently showed me a very impressive chart of the A-7 simulator history, which they can quantitatively and graphically and dramatically show that with the introduction of each one of A-7 simulators -- the 2-F84, the 2-F111, and the NCLT -- with each new simulator, there's a significant step reduction in the accident rate and now we're just about down to zero pilot error accident rates. The chart they showed bottomed out at zero for 1980, I think. It's very impressive. That's something you can quantify. Now, it would be difficult to quantify improvements in readiness. To the extent that you can through red flag or through banner scoring, I know the Navy up at . . . Wing at Oceana recently trained pilots in the 2-E6 air-to-air gunnery and then went out in the pattern and they got what are known as century banners, 100 rounds to the banner, on the first hop, which is unheard of. Absolutely unheard of. When you can show that kind of return from a simulator investment, you've entirely justified its existence.

I think that to the extent that you can quantify the benefits from a simulator, that's what you must do to justify it, and I don't think it's that hard, but I don't think, on the other hand, that it's been adequately done yet. I don't think that the Services have adequately communicated to Congress the benefits in terms of readiness improvements and in terms of safety that can be derived from a simulator investment.

Mr. Battista

I think along the same lines as Carl on that. If you want to lose friends and not influence people, come up and talk about how

many flight hours you can save by using a simulator, because most of the concerned, knowledgeable members of our committee who have been out to the field and out to the Fleet and talked to our tactical air pilots have realized in recent times that there's a tendency to use simulators as an excuse for not increasing the operations and maintenance account. For example, we talked to several Navy TAC pilots who said, "I'm limited right now to taking off this carrier in afterburn and making several passes at the ship and landing." He said, "What that shows is an increase in flight hours per dollar invested. What it doesn't show is the fact that my combat proficiency is going all to hell." I think what you really have to get across is the, as Carl pointed out, the utility of these simulators in increasing safety. What you're going to have to do is more and more increase the stimulator part of your simulators so that you can provide these guys with an analytical tool by which you can play more extensive games on your simulator and then go off and try some of these things in your exercises. So I think, very honestly, one thing you should never do is come up to the Hill and justify a simulator on the basis of flight hour savings. It won't go over well on our committee.

Mr. Old

Do you think the Congress is locked in on the proposition that simulators are, in fact, required? I suppose that's self-evident in that they have authorized and appropriated funds, but do you think something would happen if the Services said, "We want to cancel the money for simulators and put it all into flying hours." How would Congress react to something like that? I know how this audience would react.

Mr. Smith

I think the reaction on our committee, Bob, would be equally violent. Our committee, I assure you, would not sit still for that. Simulators have proven themselves. We're well beyond that stage, fortunately. The investment in simulators is justified by the return we've seen so far. The trick now is to maximize that return. And I'm not sure we've done that yet. I think we're still a long way from maximizing the return. One area where this shows up, by the way, is in a GAO report that is coming out on simulators in which they accuse both the Air Force and the Navy of not using simulators adequately to enhance operational readiness. They maintain that the operational pilots are not being required, are not required to complete a syllabus in the simulators. It's left up to the discretion of the Commanding Officers. There are those in the Navy that dispute that, but when you actually talk to the guys who are doing the flying, you'll find out that if a guy can get a check in the box from flying his airplane rather than a check in the box for completing a simulator hop,

he'll fly his airplane every time and that shouldn't surprise
anybody. But that's going to come out in the GAO report. It
will reflect negatively on the way we're employing the simulators.
I think we still have a ways to go yet before we're using them
adequately.

Mr. Battista

I agree with your assessment that your committee wouldn't sit
still for it. I think a few members on ours wouldn't sit still
for that kind of action, either. But I wonder, in the end, if
we'd be successful in heading off a move like that on the floor
of the House or in the Senate, for example, because as I said
earlier, there's no real constituency for simulators. Now, you
see what happens with production programs in the Congress, rarely,
if ever, is a production program killed. It's very difficult to
turn off a line because it's in somebody's district. Pretty soon,
I think, we're going to have to start an A-7 stockpile subcommittee
if we give the Air Force any more A-7s. But honestly, just as the
case with spare parts and O&M, there's no real constituency for
it and as a consequence, I think when people got through adding
up dollars and cents and what they were limited to in terms of
defense expenditures, I think the Services might propose and Con-
gress might go along with trading off simulators for more hardware.
I'm not saying that would be the case, but I'm worried about it.

Mr. Old

Okay, folks -- remember you heard it here first.

Should requests for flight simulators be included in the
aircraft line item or should they be separate? Would these
funds be protected from being used for the aircraft without a
reprogramming request?

Mr. Battista

I'll try to answer. There are advantages and disadvantages
to putting it into the weapon system line. For example, if there
were a cut applied to a -- let's say the F-18 program or the F-16
program in the R&D account, there'd be a tendency on the part of
the Service to spread that cut across all elements of the pro-
ject, and you might be hit with a meat axe kind of a cut in the
simulator task that you got. If you separate it, set it aside
from the remainder of the program, then you're not accurately
reporting the total cost of the weapon system to the Congress un-
less you specifically pointed that out. I don't know -- just
gut feel, I would say you're better off separating it from the
weapon system development account, but certainly flagging to the
Congress the total cost of the weapon system, this $40 billion

F-18 program, for example, did include the cost of several simulators.

Mr. Old

There was a recent criticism about the B-1 total cost, that it didn't include the flight simulator costs, as I recall. Carl?

Mr. Smith

Well, not on the B-1, since I have virtually nothing to do with that, but on the concept of where the funds should be, I think that the most important aspect of this is that the funds should be under the Program Manager's control, and apparently right now the way we're doing it, that money is not. The simulator money can be taken without the approval of the Program Manager. If there's got to be an APN in procurement there to ensure that the Program Manager retains control, then I think that's the right thing to do. If not, then if we can fence it in R&D or somehow leave it separate so that we can identify that that money is there expressly for that purpose and it's not just in a pool of money which can be reduced when a meat axe cut comes along -- I pointed to Tony when I said that and I didn't mean to imply anything -- at any rate, I think we need to get it out of that big pot and get it in its own little pot so that if anybody wants to make a cut, he knows exactly where that money is going to come from.

And back to the previous question on this constituency business, I think that the constituency for these trainers may not be great right now, but I think if someone were to go after them, I think the constituency would grow rather quickly. Because of the safety aspects of the trainers, when you stand on the floor of the Senate or the floor of the House and start talking about saving lives for a very modest investment, the constituency grows instantly. I can't speak for the rabble on the House side, how that unruly group would respond to that kind of proposal, but I know on the Senate side, where they're far more mature and dignified, they would shout down whoever tried to bring that up - - throw the rascal out.

Mr. Old

This question is somewhat related -- should a first flight simulator be built with R&D funds and should these systems be subjected to a prototype fly-off, or could a winning system be selected with a paper competition?

Mr. Rhodes

This is something the House Appropriations Committee has felt very strongly about for a number of years. I think as far

as our committee goes, it's six of one and a half-dozen of the
other. It could go either way. If a department feels strongly
that this ought to be in the aircraft procurement account, where
it formerly was, prior to the House making its decision, then I
think they should request this and we'd certainly be willing to
consider it on our side and I would assume that the House would,
also. But I have no strong feelings along those lines and I'm
not sure that the committee does.

As far as this second point, whether the system should be
subject to a prototype fly-off, or whether you can do it by
paper competition, a fly-off is certainly the expensive way to
do it. We should be able to examine the options without going
through a fly-off. One thing I'd like to mention is the fact,
I think, as most of you know, today we build the military simula-
tors to the same specifications as we have for the military air-
craft and it's my understanding that the civilian airlines do not have
the same level of MIL-SPECs as we require for the military simula-
tors, and whether they just need certain parts, whether they pro-
cure those from Radio Shack or J.C. Penney or whatever, and I
think that this is something that the department should look at
very closely and I think that there could be meaningful savings
that could come from watering down some of the MIL-SPEC items
that are included in our simulators.

Mr. Battista

I think it really depends on the level of complexity. If
you're not pushing the state-of-the-art, then I agree entirely with
what Fred said about relaxing the requirements to get in some
non-MIL-SPEC hardware in these simulators to bring the cost down.
I think we're ignoring entirely too much the advances of the semi-
conductor on industry in terms of bringing in some of the LSI and
hopefully, pretty soon, the VHSIC kind of technology into our
simulators and, indeed, into our weapons systems. But I would
hate to think that at this stage of the game, the Government was
not smart enough to evaluate a paper competition and pick a
winner. I think it's mandatory that we follow that philosophy in
the coming years, because Defense, contrary to a lot of well-
intended people out there, is not going to get the increases that
we had projected or the increases that are necessary to keep pace
with the Soviet threat. I go back to 1981, in February -- I was
at Wright Patterson addressing their contract Air Force/Industry
Association meeting and one Air Force General commented that this
was now the time to put everything that we needed that we didn't
get under the Carter Administration back on the plate. I advised
against that because I said when you cut Federal spending and you
cut taxes and you increase Defense spending, there's a high proba-
bility that that's going to produce the . . . . . Not too long
after that I was down at the EIA conference in Florida and I had
taken all the things that were being added to the budget that the

Services wanted -- their wish list, so to speak -- and I demonstrated to that conference that by 1987, the Defense budget, if we had funded these things, like the F-16s and the C-17 and the F-18, and battleships and carriers, would give us a half trillion dollar Defense budget. Ask yourself if the American people or the economy could stand a half-trillion dollar Defense budget in FY 86 and 87. The answer to me is clearly no. I don't believe that we're going to be able to adhere to this policy of competitive fly-offs and competitive demonstrations. I think we're going to have to, in order to get the weaponry we need to keep pace, we're going to have to do more selection from paper studies and take the best approach and go forward with that so we can spend the residual dollars on the things that we need. As I said earlier, I've been to the field and the Fleet very recently. We've got a single aircraft load-out among some of our units of air-to-air missiles. And we've got only days of supplies of the kinds of ammunition that are essential to a war-fighting, war-winning capability. We need more readiness; we need more sustainability. We're going to have to get off of some of these competitive developments. I honestly think that there is a danger of building simulators with R&D funds. We didn't do it that way several years ago. But I think it's more important to focus on the approach than it is to focus on the color of the money.

Mr. Old

Carl, you addressed part of this, about whether the Senator was going to be able to hold a hearing. I think you indicated it may be January or February because of his general condition and recovering from his operation. Why don't you tell us about the general purpose of the hearing, what was in mind there, please?

Mr. Smith

Well, Senator Goldwater has held two similar hearings in the past. What we are interested in is seeing what sort of progress we have made since those first two hearings, and we want to establish a benchmark for where we are and where we're going in the future. Of particular interest to Senator Goldwater is the degree to which both the Air Force and the Navy, who are probably the two largest consumers of simulators, are heading down the same path. In the past, in most programs, if you turn them loose, they'll go in diametrically opposed directions; if they're given some sort of constraints -- Congressional interest or whatever -- you can sometimes bring them somewhat closer and it appears from my research so far, in preparation for the hearing, that this may be one of the few cases where we've got the Air Force and the Navy genuinely headed in the same direction toward computer-generated imagery and eventually out of the . . . business and away from the . . . . . So we're interested in the new technology that's

being examined and developed for simulators in the future and we're interested in the degree of cooperation among the three key Services, and we're interested in seeing what sort of progress we've made since the last hearing was conducted.

Mr. Old

It's been my experience that whenever the Congress announces that it's going to hold a hearing, particularly a kind of out-of-the-normal hearing cycle, a lot of people in the Pentagon and maybe in other places say, "Oh, oh -- what's happening and what is this all about? There must be some ulterior motive behind this particular hearing and someone must be in great difficulty." Do you want to amplify on that, Carl? Is anybody in great difficulty?

Mr. Smith

A lot of folks are in great difficulty.

Mr. Old

With simulation, I mean.

Mr. Smith

No, we're not focusing on any particular program. This is certainly not an effort to expose any that are in danger of being cut or killed. This was generated largely by Senator Goldwater's abiding interest in simulation.

Mr. Old

That will ease a lot of people's minds.

Mr. Smith

Bob, let me add one statement. As Bob said, when a committee announces that it's going to hold a hearing on a particular subject, it generates a lot of interest and activity, certainly over at the Pentagon. One of the benefits of this sort of a hearing is just that -- it focuses a lot of attention on the issue of simulators and it communicates to the Pentagon that there really is a constituency over there that does care about simulators. And it causes OSD to take note, too. Folks in OSD operate just the way we do over in Congress -- that is that they go around putting out a lot of fires. They are sometimes more reactive than initiative in OSD. This could be seen as somewhat of an initiation rather than a reaction, and that what we are trying to signal to OSD, and to some extent to industry, too, is that there really is strong support and there is interest and we'd like to know what's going on.

Mr. Old

Great. I think that's an excellent response.

In the opinion of the panel, does the Pentagon pad its budget requests? Does anybody want to try that? Don't all of you jump at once.

Mr. Battista

Yes, I think so -- but not maliciously. I think that's evidenced by the fact that -- well, let's go over a little bit of history. If the committee recommends a cut, let's say of a million dollars, from a particular program, we get a reclama and in that reclama, it talks about how the world will collapse if they have to experience this million dollar cut. We get all the heart-warming sagas about how many people will be laid off and how the program will be adversely affected and it will add $300 million to the overall program costs. I'm exaggerating a little bit but it's not too far from the truth. That's the general theme that they follow. Then about two months later, we'll get a request for reprogramming and they'll use that particular program that we cut as a source of funds. We may have even restored the funds for it. And when the witness comes up to justify the reprogramming, we'll say, "What's the impact on the program?" Now, we may have put the million dollars back; he's taken seven out. But he'll say, "Well, we've looked at it again and it has no affect whatsoever on the program. It's okay." I swear that's the absolute truth. It happens time and time again. I don't think they do it maliciously. I think they actually do try to program for contingency, and in that respect, I think the budget's padded. In many of your major programs, there's what they call a management reserve fund, or TRACE. And that's to handle contingencies, and contingencies do crop up when you're talking about basic research, exploratory development, advanced development, and full-scale engineering development. As I said earlier, if we knew how to do R&D perfectly, we could go right to production. So I think the very simple answer to that is yes, and I think there's a reason for it. I can't fault them on it until it reaches the point where we're really in a crunch and we're going to have to enact cuts to meet, let's say a budget target ceiling and they decide to apply a meat axe type of approach across the board, rather than to really comb these programs and try to find out what they can offer up so that we don't we don't affect everything adversely. I don't find anything wrong with that. I think it's just an attempt on their part to program properly so that they can meet contingencies.

Question

How much should they pad it?

Mr. Battista

Well, you know, I don't like to see any padding whatsoever.
I would much prefer them to be very candid about it and come up
and tell us that there's an associated risk with this program
and we've got so much programmed for TRACE or management reserve
and leave it to the Congress to decide whether or not it's worth
leaving that money in, based on, obviously, input from the indus-
try and the Services.

Mr. Old

I think there's a good message here, and that is level with
the committee and tell the staffers what the requirement is, what
the problems are. That seems to be the message I get.

Mr. Battista

You know, you tell the truth and you never have to worry
about what you said the last time. I hate to sing their praises,
but the Marine Corps comes up to Capitol Hill and asks for 500
widgets and they leave with 750, and the reason that's the case
is that there's no question in many of the minds of the members up
there that they're a very candid, honest, truthful Service and
they tell it the way it is. Case in point -- when the all-
volunteer force was very fashionable, one man stood before the
committee and said that his Service was in good shape in spite
of, not because of the all-volunteer force. That was the Com-
mandant, Bob . . . .   They try their damndest to meet Congres-
sional guidance and try to implement it, certainly not at the
expense of the Marine Corps or their capability, but they try
awfully hard. Bob, if you'll bear with me for a minute, I want
to read something to you. The title of this article is "Truth
is a Fragile Commodity." It says, "The true state of things is
frequently unpleasant. That's why we don't tell the truth more
often to ourselves or to others. It is more convenient not to.
Instead, we rationalize our own imperfections and those of the
world around us. If we work hard enough at these rationaliza-
tions, we soon believe them ourselves, and when we do, our grasp
of the truth is a little less sure than before." Now, the man
who said this -- this was given to a graduating class in Germany --
was severely chastised for this speech. It was given by a mili-
tary man, Don Starry.   I think there's an important message in
it. If I have to give any advice to my four kids, it's certainly
to follow the guidelines that he laid out in his speech. Be
truthful with these people and you're going to find you have
more friends on Capitol Hill than you do adversaries.

Mr. Old

Okay, thank you very much. That was a good discussion.
I want to throw this question in here very quickly. It talks

about lobbyists. This is a question we hadn't planned to ask, but I think it might be of some interest. Is there a legitimate role for Defense lobbyists? Are they effective for the contractors, and how do each of you deal with them?

Mr. Rhodes

Yes, let me start. I see every lobbyist that comes to the door, just as I see the industry reps and the Service people. I think there is a definite role for the lobbyist. I'm looking for information wherever I can obtain it and I think they are a valuable commodity in representing industry. I'm very happy to see them.

Mr. Smith

Bob bought me dinner last night. There's no question that the lobbyists can be very effective. They serve a very, very useful purpose, other than buying us an occasion meal! There's no doubt about it. They communicate. Still there is not enough communication between Congress and the military and between Congress and the contractor. There is not enough communication. Some of these instances that appear to be prevarivation are really, I think, more often than not the result of miscommunication rather than an attempt to deceive anybody outright. If you don't have enough time, if you can't get access, whatever, you have a tough time making a case. The lobbyists, the consultants can get in and can communicate.

Mr. Old

This question is a long one to read. It relates to VTX and I think the question really gets down to -- as far as the total system concept is concerned, do any of the panel members have any problems with that approach and do you have any concern about the flight simulator and other training devices that are a part of the VTX program.

Mr. Battista

Well, this is one that I think Carl and I have a little bit of difference over. I have no problem with the requirement for the VTX and I have no quarrel with the total system approach. My problem goes with the Navy methodology in procuring this system and basically the affordability issue. Right now -- Carl, correct me if I'm wrong -- I think the Navy has 13 active aircraft production lines and if they had an increase of up to 10 percent a year, they couldn't meet their inventory objectives. And you know that when you under-utilize a production line, the unit price goes up and that's why we have a $40 billion F-18 program. We can buy that program out earlier and save a lot of money, but you have to

face the realities of life. You can't buy everything at the
optimum rate in the same year. But if the APN account, the air-
craft procurement account, hiccups, it may implode by virtue of
its own weight and therefore we thought it was absolutely essen-
tial that the Navy, if they were going to add anything to burden
that account any further, do it at an efficient rate. Now, I'm
aware of what the contractor proposed for the VTX total program
cost. I'm aware of the fact that the Navy's estimate is 100 per-
cent greater than that. When the Navy came forward to us over
a year ago, they said there was an urgent requirement to get the
wet version, the carrier-qualified version, as early as they can.
Now, to obviate some of the front-end loading costs, they decided
to buy some dry aircraft and then go wet downstream. The program
is going to take many years to complete. I think the fixes that
the Navy estimates are over-priced. We talked to the BAC people,
the McDonnell-Douglas people, and it is our opinion that there's
not near as much to be done from an engineering perspective as
the Navy says. We think there's too much testing associated with
the program. But I'm a firm believer in the requirement for the
VTX. I just think we ought to buy it sooner, buy it cheaper, and
if we believe the Navy, go forward with the wet variant at the
outset.

Mr. Smith

Tony and I have gone over this a number of times in private.
There are, in fact, 13 aircraft production lines for the Navy in
operation right now and the number is rising steadily. I think
by 1986 or so we're going to have 18 Navy aircraft production
lines, if you can imagine that -- all of them, every one of them,
operating inefficiently. By then we'll have about 30 military
aircraft production lines, when you count all the Army and Air
Force aircraft, as well, and every one of them will be operating
inefficiently. So why we should impose the requirement on the
Navy that they all of a sudden get efficient is beyond me. We
cannot afford -- we do not have the money in the budget and we'll
never have the money in the budget unless we go to war -- to build
aircraft at efficient rates.

On the issue of the wet/dry requirement for the HAWK, our
committee doesn't have a problem with that. We recognize that in
every training squadron that takes aircraft to the ship, there are
aircraft that don't go to the ship because they're not capable.
In some training squadrons -- I'd suggest this is true in some
of our TA-4 squadrons -- there are several, a significant number
of aircraft in that squadron that can't go to the ship. Not every
aircraft has to go to the ship. They don't go to the ship on
every mission. They go to the ship only a very small number of
times over the course of the training cycle. So it's not at all
unusual that we should have dry aircraft, which we can get early
and we can get cheaper than wet aircraft.

Mr. Old

Is this going to be an FY 84 issue again, then, Tony?

Mr. Battista

We're having a conference on it right now. I think it will be because, as I said, there are other factors involved, too, and that is the Navy's pricing of the structural changes and the test requirements. I guess I disagree with Carl's rationale that because we've got 13 inefficient lines and we'll go to 18 and the Army and the Air Force will similarly have inefficient lines that we ought to exacerbate the problem by having still another inefficient line. We're not buying thousands of aircraft here. We're buying -- the maximum, I think, is 308 aircraft and, as I said, I recognize fully the reality of life that we can't buy everything at the maximum efficient rate, but I think here is one instance where we can and minimize the adverse effect on the APN account. I think the forecast for the future on VTX is good, provided the Navy does its homework and tries to streamline the program to the extent that we're saving some money without compromising, I think, the ability of the trainer. I was over to BAC in July. It's a super airplane. It really is, and I think it's going to make an excellent trainer. I'd just like to buy it a little cheaper.

Mr. Old

Okay, thank you very much. In the interest of time, you fellows have question 18 in front of you here and I'd like to do kind of a quick round robin and just give me about 15 seconds from each of you if you want to comment, and then we're going to go to the audience. So you start getting your questions ready and we'll take those questions to the panel in general or to a specific member of the panel. Let me get a quick round robin and start with Tony on question 18.

Mr. Battista

The legislation that you've heard about that is coming out of our committee, I didn't work on. Another member of the staff worked for the Chairman on that. But basically, our concern with contracting out is based on the number of horror tales that we've experienced in the past. Some contractors will buy in, they'll hire personnel as cheaply as they can get them, a year or two later they default, and we wind up having lost our in-house capability and we're still behind the proverbial eight-ball. There are a number of these cases and our committee is rather skittish about contracting out services that we feel are maybe essential, or services that maybe are not essential in times of combat but for which there's an indication that you folks are

going to buy in and then bail out. So, it's not directed toward simulators, contracting out of the maintenance or anything else. It's just based on a number of bad experiences in the past.

Mr. Smith

On the issue specifically of simulators, I'm aware that the Navy plans to do away with all their TDs by 1986, all maintenance in the operation of the simulators will be performed by contracting out, or through contracting out. I think that's probably a good way to go, and there's no opposition that I'm aware of on the Senate Armed Services Committee toward that approach. Given the increasing complexity and sophistication of simulators, the difficulty of training young technicians in the Navy to operate and maintain those systems is increasing at the same pace, and in fact, maybe at a faster pace. The difficulty of retaining those people once they get those skills would be particularly great, so it's rather logical that you would go out and contract for what I hope will be long-term fixed-price contracts for those services. I'm aware that in Pensacola right now we've got retired naval aviators who are operating simulators, who are actually the simulator instructors for the Training Command, which I think is a superb idea. You give the benefit of 20 years of aviation experience to a young kid who is getting maybe his first exposure to aviation. It's a priceless commodity and it shouldn't be lost. If we were to do business the old way, you might have a 22 year old naval aviator giving the benefit of his experience to a 21 year old naval aviator, which doesn't have nearly the impact, in my opinion, of the retired instructor.

Mr. Rhodes

I find some sympathy on the part of the members of the Senate Appropriations Committee with the desires of Mr. Price on this issue. Many members feel that perhaps we've gone too fast, too soon on this, and we ought to sit down just a little and find out what has been done and perhaps go a little bit slower. There is a definite feeling by some members that perhaps some of the things that we've made an effort to contract out would impinge upon military readiness and there's strong support that we not do this.

Mr. Old

Now, you've heard the witnesses. Consider yourself as a committee. This is your opportunity to ask the witnesses questions. So I'll take questions from the floor. I'll try to repeat the questions so everyone can hear.

The question was the functional arrangement in the House Committee and the mission arrangement of the subcommittees and the Senate Committee, is the House liable to change or does Tony see any problem with that.

Mr. Battista

Now, our committee will not give up its effective, efficient way of conducting its review of the budget simply to mirror image what the Senate Armed Services Committee is doing. No, seriously, it's no real problem. I have to admit that it was easier in the old days when we used to go over there and negotiate with . . . and Charlie Cromwell and Bob Old, and that was about it. You'd come up with a package that you'd present to your Chairman in the conference committee. It was easier in the old days. As it stands right now, for example, Tom Cooper and I go over and we talk to Carl on programs in his area, and then in the strategic, we have to switch gears, and he walks out and he gets a chance to take a breath, and Frank . . . comes in and the two of us continue to sit there, then Gaffney walks out and then Wayne . . . walks in and we talk about Navy programs, and they platoon us to death. But really, and I don't say this because he's here, they're all a group of very personable people who really want to do a good job and it's no real problem, in my view. Carl, what's your perception? Do you think we've got a reasonably good way of handling it?

Mr. Smith

It's awkward, because it requires not only that the staff have these multiple meetings, but also the members must. Senator Goldwater is the Chairman of the Tactic Warfare Subcommittee and he must meet with the Procurement Subcommittee of the House and also the R&D Subcommittee. Whether or not the House is going to change, the House Armed Services Committee has stood and resisted progress now for - - - - -

Question

How many of the Congressional committee members are computer literate and are aware of data base, acquisition, and that sort of thing?

Mr. Battista

Well, you know, we only had one engineer on our committee and he was defeated in his attempt to run for the Senate. We had one other individual, a member of Congress who is not returning, who had an in-depth knowledge of computer sciences. I hope nobody uses these statistics -- if anybody knows something about computers, they get defeated in their attempt at re-election. But, it's a rather complicated area to get across to the members; I'll give you an example. On military computer family this year, the main issue was whether we should standardize at the instruction set architecture level on the utility of ADA, the new software standard language, and it was a very difficult kind of an issue

to explain to the members of Congress. It's rather difficult for the staff because quite honestly, 10 years ago when we'd buy a computer, it would be good for 5, 7, 8 years. About 5 years ago, your computer was good for about 3 years. I was totally impressed with the INTEL 432 micro mainframe chip set that I was reading about that had hardware execution of ADA constructs, only to find out that HP has got a new chip out now, not with 90,000 devices on it but 455,000 devices on it. I hadn't read about that for 3 months, I mean about the state of technology. That's how rapidly it changes and when you have a whole gaggle of other disciplines to worry about, it's tough to keep pace. I do believe that DOD is behind the commercial world in bringing semi-conductor technology and in bringing computer technology, contemporary computer technology, into our weapons systems, into our training systems, and into our simulators. And I think that has to be done. I think you people can do a better job in translating that to the members of Congress. It's rather difficult for us to do it, but I think if you people can put it in layman's terms and you do communicate with these folks up there, it's a do-able kind of thing. We don't have near the number of computer literates, either in the form of members or in the form of staff, that we ought to have, but if we covered every discipline, we'd have a population up there on Capitol Hill that would be insurmountable. So I don't know if that answers your question, but there's no doubt that we're behind the commercial world, we're behind the computer game world, we're behind a lot of the civilian sector in terms of bringing that technology onboard. And I think if we do, it's going to be cheaper, it's going to be more effective, and believe me, I'm a proponent of getting off some of these unrealistic MIL-SPECs. I'd like to see more commercial grade hardware come into the inventory because I think it will do a better job and I think it will be a better job at less expense.

Question

How does one micromanage 3,500 programs with two people? I'm referring to the number of line items in the R&D budget with Tony and Dr. Tom Cooper.

Mr. Battista

We don't, being quite honest about it. Micromanagement is kind of a subjective thing. I've come to learn that if I ask a guy a question about his program and I happen to mention Mega-Hertz, that's micromanagement. We don't micromanage. We take a look at military requirements and we try to ensure that the program before us addresses those requirements, and we try to work with the DOD in establishing priorities. It's a two-way street. If DOD refuses to communicate, if they withhold information from us, then you have no choice. You can only spend a limited amount of time on a project when you have 3,500 of them, so you have no choice but to make the best decision that you think is going to

be responsive to the field or the Fleet user. I don't want to
micromanage anything. Believe me, the best thing I can do for
my country is to work toward the abolishment of my job. There
are too many people in the weapons system process already. It
used to be that you had four committees of Congress who would
authorize and appropriate a budget. Now you have a Budget
Committee. Do they get into weapons systems? You bet. You can
read the Budget Committee's report on the B-1 or the MX. You
have an Intelligence Committee now. You have Government Ops,
who's worried about management and oversight. You have Foreign
Affairs, who worries about the morality of chemical weapons. On
the other side of the river you have OSD, PA&E. You've got
USDR&E; you've got OMB. We've got far too many players in the
process today. Everybody is well intended, believe it. But the
overall effect has been that it now takes us 20, 22, 23 years
to transition from concept formulation to the deployment of a
weapon system, and believe me, the Russians don't have that kind
of a problem. You look at what they put through the pipeline.
Four new airplanes right now, as Carl well knows, coming out of
. . ., every one better than the last generation. I commented
yesterday at the PM Conference, if a 2nd Lieutenant enlisted in
the Army in 1962, and started working on the PATRIOT program,
though it wasn't called PATRIOT back then, he could put in his
papers today. He'd be eligible for retirement. He would have
his 20 in, never having seen the first PATRIOT system fielded.
That's a deplorable state, as far as I'm concerned. We don't
micromanage. We try to work with the Services. When they work
with us, when they communicate with us, I think it results in a
better Defense program.

Mr. Old

I promised my panel chairman, Gary Morton, that we would
finish at 5:15, and in keeping with that, I would like to just
thank very much the panel members. They really have busy schedules
and they do have a lot of other things to do. They did have to
work to work this into their schedule, and so I really appreci-
ated them coming down. I think they did a super job, facing the
firing line here and giving it to you candidly and telling it
like it is, so I guess the message is, let's all of us tell it
like it is and let's stay in touch. I thank you very much.

Mr. Morton

I started off this afternoon saying this was the first of a
kind, in terms of the panel, and I think the easiest way to finish
this up is by saying I certainly hope -- and I'm sure that you
share this -- that this will definitely not be the last. Thank
you all very, very much.

BANQUET

17 November 1982

Dr. Gardner

May I introduce Commander Hugh Brogan, Chaplain of the Recruit Training Center.

Commander Hugh Brogan

Now it's a time to say a prayer.

In a world that's becoming computerized, in an association that is so often totally involved in training and simulation, a personhood may fade. Yet each of us here tonight has the greatest of dimensions which no training or computer can ever capture or equal, a gift of humanity. It is this which creates, defines, and controls an awesome power, a power over people and nations, the world family. And as we move in these dimensions, we encounter staggering new advances and possibilities. What was once a dream or fantasy is easily a reality. We also sense not less, but more of the magnificent power of our God, a supreme power. We feel an identity with His limitless universe, and like Einstein, we say God does not play dice with the universe. If our concept of God is the good of people and nations, then truly we can ask and expect His blessings upon our work and our commitments, for whatever is done clearly for the good of all is done with God's help. So, God, bless us with faith in ourselves when we doubt, faith in our mission when we're challenged, and love of a country that is clearly a land of freedom as no other. That our vision is clear, our faith in self made strong, and our professions performed for the good of our land and all lands. Amen.

Dr. Gardner

On behalf of the Association, I'd like to welcome you to this evening's banquet. As you know, the conference is dedicated to encouraging communications between the Government and industry in the area of military training systems. This year, we're focusing on the user, project management, and the development of new technologies and methods and training. As such, I'm afraid all of us owe an apology to Disney's new technology marvel. I've heard from numerous attendees that our exhibits here this week have upstaged that new theme park. I think all of the exhibitors can be proud of the displays and demonstrations located throughout the Hyatt Hotel.

It's my pleasure tonight to introduce Rear Admiral John F. Adams, Deputy Chief of Naval Education and Training at Pensacola. A Harvard graduate in 1952, he attended Officer Candidate School in Newport, Rhode Island, and was commissioned Ensign in 1953. He holds a Masters Degree in International Affairs from George Washington University and Admiral Adams has served in destroyers in both the Atlantic and Pacific Fleets, including tours in the commissioning crews of USS WILLIAM V. PRATT and USS JEWETT, as Commanding Officer of USS COCHRAN, and as Commander, Destroyer Squadrons Five and Seven. Shore tours have included duty as a student and on the faculty of the Naval War College, in the Office of the Chief of Naval Operations, and in the Bureau of Naval Personnel. Admiral Adams has been awarded two Bronze Stars, the Navy Unit Commendation Medal, two Meritorious Unit Commendation Medals, in addition to various campaign medals and ribbons. Ladies and gentlemen, Admiral John Adams.

Rear Admiral John F. Adams

Thank you very much. I appreciate that gracious introduction. My purpose and privilege here this evening, however, is to simply introduce our principal speaker. It's a great privilege and a pleasure for me to do so and to introduce a gentleman who really does not require any introduction, but I would simply remind you of a few highlights in his distinguished career. In 1959, the name of John Glenn became a very familiar name throughout our country and, of course, has been ever since then, when he was named one of the first seven astronauts for the United States. At that point in time, however, he had not just been born and did not spring fresh at that point in time. He had served his country for some 16 or 17 years in the Marine Corps at that time and had achieved a distinguished record as a Marine Officer and as a Naval Aviator. He had attended Muskingum College in his native state of Ohio, gone into the Marine Corps in 1942 and was commissioned in 1943, received his wings, and during the balance of World War II, flew 59 combat missions in the South Pacific, flying F-4U fighters in the Marshall Islands. After the normal duty tours and the short interim between the end of World War II and the beginning of the Korean War, he saw further combat duty in the Korean War, where he flew 90 combat missions in that conflict. Following the Korean War, he completed test pilot training at Patuxent River and in 1957, he set a transcontinental speed record, flying from Los Angeles to New York in 3 hours and 23 minutes in an F-8U. So at the time that he became an astronaut in 1959, he was certainly no rookie and was a gentleman and an officer who had achieved an enviable record in the Marine Corps. Following that, of course, after extensive training, he became the first American astronaut to orbit the earth, completing 3 orbits in a 5-hour flight on the 20th of February, 1962. Colonel Glenn retired from the Marine Corps after 23 years' service in 1965. For the period of his career in the Service, he was awarded five Distinguished Flying Crosses, the Air Medal with eighteen clusters, and

numerous other awards and decorations. Also, in connection with his duties in the astronaut program, he was awarded the National Space Medal of Honor and the NASA Distinguished Service Medal.

Upon his retirement, Colonel Glenn returned to his native Ohio. He entered private business with the Royal Crown Company, served as Vice President, and from 1967 to 1969, he was President of the Royal Crown Cola Company. At the same time, he became active in politics and in the Democratic Party in Ohio. He first ran for the Senate in 1964, but had to withdraw because of serious physical injury. After a narrow loss in 1970, he won election in 1974, carrying all 88 counties in Ohio and winning by more than 1 million votes and he was re-elected in 1980, with nearly 70 percent of the popular vote in Ohio. He is a member of the Foreign Relations Committee and the Governmental Affairs Committee in the Senate, the Special Committee on Aging. He is also one of eight members of the Democratic Policy Committee in the Senate. He is here this evening with his gracious wife, Annie, who we are certainly happy to see here and so pleased that she could accompany him. It's a great pleasure for me to introduce to you this evening a great Marine and Naval Aviator, a successful businessman, and a distinguished senior Senator from the state of Ohio, the Honorable John Glenn.

The Honorable John H. Glenn

Thank you very much, John, and thank you -- mainly gentlemen, but gentlemen and ladies. I guess after an introduction like that I'd be smart to quit while I'm ahead. I'm reminded a little bit of a dinner that Annie and I attended not long ago in Ohio in which the person introducing me built up accomplishments and accolades like I never dreamed of having, and almost invented things in my biography, and finished up this long and over-generous introduction by saying, "There are few truly great men in this world." And then he introduced me. Well, now, that's very heady stuff. Going home that night, we were driving along and I was thinking about this, I guess, and I was mentally rather basking in the glow of this over-generous introduction and I said, "Annie, you know if you think about it, there aren't very many really truly great men in this world." And it took her about two seconds to say, "Let me tell you something -- there's sure one less than you think there is."

But I am delighted to be here. I noted that NSIA didn't pick just any old Admiral to introduce me tonight. They chose John Adams, a man whose very name conjures up things Presidential. I'll let that one lie right where it is. I also want to compliment this organization very sincerely this evening on your brilliant selection of gifts for conference participants. In fact, I think those watch pens actually epitomize the problems that occur in the procurement process. The Navy and Marines wanted the watch pens to be waterproof. The Army insisted they

be shock proof, and the Air Force wanted the dials to display at
least six different time zones. Well, NSIA took all these speci-
fications into account and then produced a pen that fit industry's
needs. Now, I've been at one time or another in my checkered past
an engineer, a test pilot, astronaut, I've initiated nuclear non-
proliferation legislation, energy legislation, I've spoken all
over this country about the need for increased R&D, not less, in
our time period, and if anyone here tonight can figure out how to
set this darn thing, please show me after it's over.

In thinking about my topic tonight, I'm reminded of what re-
cently happened to one of my Ohio constituents. He's a plumber
from a small town in Southeastern Ohio and about a month ago, he
wrote to the U.S. Bureau of Standards about using hydrochloric
acid to clean drain pipes. Several days later, he received this
reply. "Dear Sir: The efficacy of hydrochloric acid is indis-
putable, but the corrosive residue is incompatible with metallic
permanence." Now, the confused plumber wrote again, "Is the acid
okay to use or not?" He got a second letter back. "Dear Sir:
We cannot assume responsibility for the production of toxic and
noxious residue and suggest that you use an alternative proce-
dure." Well, still baffled, the plumber wrote a third time and
he said, "Do you mean it's okay to use hydrochloric acid?" And
he got a final letter back from the agency which resolved the
question. "Dear Sir: Don't use hydrochloric acid. It eats the
hell out of the pipes." That story illustrates what Harry Truman
used to call "plain speaking." That's exactly what I hope to
give you tonight -- some straight talk about a subject that's
all to often shrouded in very confusing rhetoric. That's the
subject of national defense.

Now that the elections are over, the size of the Defense
budget is back in the headlines again. It will continue to be
so and I can guarantee you, the debate is going to heat up even
more once the new Congress convenes in January. We'll be back
into guns versus butter, social programs versus the military,
and a debate that I never have liked and never have gone along
with. As was mentioned a moment ago, I spent 23 years in the
Marine Corps and I apparently was under some misconception
during those 23 years, because I felt that in those days we and
the military today are helping provide what the greatest social
program is that any government has a responsibility to their
people for, and that is to keep their people alive and independent
and free as the number one social program in the country. Then
you try and do the other things.

The pressure to restrain Defense spending is certain to grow
and I suspect it's going to be even greater in 1983 than it
was last year or the year before. Politics may be part of the
explanation, but it's certainly not all of it. The Administra-
tion now seems to be almost as divided as Congress, if that's
possible, over the question of how much we should spend on

defense. Publicly, the Administration says that the President is
committed to a 7 percent real increase in military spending and
that he will accept nothing less. But privately, a lot of the
White House officials are saying that looming budget deficits,
which I would add are caused basically by the one-fourth revenue
reduction last year over a three-year period of time -- these
deficits, which some say could reach $180 to $200 billion and
which the Congressional Budget Office figures that they're work-
ing on internally, I have understood from talking to some of the
people, are $216 billion -- may force the President to back away
from that 7 percent figure.

Now, I can't tell you tonight how this debate is going to
come out, but I would like to offer a few of my own thoughts about
this issue and why we're in the position we're in, and a few com-
ments in that direction.

Just a slight reference to history, here, in starting out -- a
little historical background. Coming out of World War II and
Korea, there was no doubt about American superiority around the
world. We were up here, we talked about some lacks in certain
areas of defense, but by and large, we had a capability like this
and the Soviets were down here someplace. They weren't even in
our league. And they had made some adventurous moves into Hungary
and Czechoslovakia, but their troops were already in there. It
was not a new invasion that they were embarked upon. And then
along came the Cuban missile crisis of 1962. I think that's the
change point in modern times on what began to happen. Because the
Soviets were turned around, they went home with their tail between
their legs and I think they vowed never to be put in that posi-
tion again. And they started to build, and they have outspent
us ever since that time, almost, by some 30 to 50 percent a year.
Where they had basically coastal defense forces and major defense
forces for the motherland, the heartland of Russia, they now
started building power projection forces, and a power projection
Navy, and a power projection Air Force, and they already had a
ground force double the size of anything we had in this country.
In those 1960s and 70s, the United States reduced military spend-
ing, while the Soviets increased. We spent about 5 percent of
GNP on defense; the Soviets spent 10 to 11 percent of their GNP
on defense for all these many years. And throughout the 70s, the
Soviet spending for military equipment -- for equipment, now --
was 55 percent higher than that of the U.S. An increased Soviet
military strength, lest we believe those people who say "Don't
worry about it -- they would never attack us. Don't worry about
it. So what if they get stronger than we are." I think as each
one of these Soviet adventuresome moves has been made that we
tend too often to take that in some sort of isolation and not
remember the whole pattern of things. Let's just look for just
one minute at the pattern. Even as they have come close to us,
and I think if we don't do some things to modernize, they're
going to go ahead of us in about 1988 or 1990. The trend lines
are in that direction. But even as they have come close to us

in past years, what has happened? Well, go back to the original
coup in Afghanistan. Then major infusions of Soviet equipment
into Syria, Iraq, trying to destabilize that part of the world,
extend their influence down into that Mid-East area. And then
they tried a new military experiment and I guess we should have
a map here behind me this evening, because remember what they
tried next? It was an experiment with all those Cubans using
Soviet equipment. And they came around into Angola and Zaire
and Ethiopia and Somalia -- and that one backfired on them a
little bit. But then South Yemen. Then they doubled their Naval
force in the Indian Ocean that Tom Kilcline here has responsibili-
ty for Navy-wise right now, doubled their presence in the Indian
Ocean astride our oil supply lines that were, at that time,
supplying 18 to 20 percent of our oil but which supplied 50 per-
cent of the oil for Europe and 75 percent plus for Japan. The
energy jugular of the free world. And they went into South Yemen.
They then took the disputed Northern Territories Islands north
of Japan, 12,000 troops in there -- didn't bother to continue
with negotiations which were underway at that time -- took those
islands, $2 to $6 million a day, depending on which expert you
want to listen to in support of Vietnam's incursions into old
Cambodia, now called . . . , and capped this whole thing off
with the military takeover of Afghanistan, the first flat-out
military invasion of another nation like that since World War II.

Now, what are we to make out of all this? And that doesn't
even count the South American adventures and the Central American
adventures that they have had in the last few years. Are we to
say, "Well, it doesn't really mean that much. They wouldn't
dare attack us." What does it all mean? Does it mean that war
between the U.S. and the Soviet Union is inevitable? That it's
imminent? No, it doesn't. But it does mean that if Soviet
tactics have changed, their goals have not. Chief among those
goals has been the Soviet quest, or I guess we might almost
call it a paranoia, for absolute security. Now, it's one thing
to be out on a quest for security, but when you stretch that to
absolute security as they have been trying to do, then you try
and set up buffer states and all sorts of subterfuge and all
sorts of under-the-table deals, and all sorts of things going on
all over the world. And the Soviets have maybe some good reason
for paranoia, if we're honest about it. They lost 20 million
people in World War II. Twenty million people. Many of you
have been to the Soviet Union and you've visited that big shrine
at Leningrad, where they carted out an estimated 900 bodies a
day. There's one common grave area and you place a wreath
there and it is impressive. And the Soviets have set about abso-
lute security, set about that as their goal. Security can only
be achieved with the help of military conquests and political
subversion. And, of course, a second objective is to spread
their brand of government, their brand of communism by whatever
means possible. That's been a long-term goal, once again, at
least in part because of their own paranoia about their defense
needs.

It means something else, as well. It means that we and our allies must be prepared to defend our vital interests. Vital interests are fundamental interests and I'll come back to that a little bit later. That, in turn, means we must maintain a strong military capability that is adequate to the task. So how do we go about ensuring that capability and equally important, how do we go about building the political consensus that's necessary to maintain it? Well, first I think we must recognize that U.S. needs do, in fact, differ. We're a different type society and differ from those of the Soviets, because for one thing, U.S. personnel costs go far higher than the Soviets. They absorb well over 40 percent of our Defense budget. We have budgetary constraints that the Soviets do not have and these will intensify in the months ahead. Once we've accepted that reality, the next step is to define the objectives we want our military to support. And here, I think, we get afield too often. With all due respect to all of you here who are Defense contractors, I think we sometimes have the Pentagon acting on whatever the last vendor was that came up the Mall Entrance steps to the Pentagon without regard of what I think should be a fundamental that's decided first, and that is what is the foreign policy of the United States in these different areas. Shouldn't our Defense policy in our military purchases be to back up a well-thought out foreign policy and not the other way around? It just seems so fundamental and yet we don't really base it on that. We can pretty well define what some of our fundamental interests are. I said vital interests a little while ago. Fundamental interests. And then we should set about our military purchases to determine how we're going to defend those fundamental interests. Europe is an economic center that we helped recover after World War II. Japan, an economic center we helped recover after World War II. The Mid-East, the Persian Gulf area -- the biggest flow of wealth, increased importance in that area, of anything that's happened in modern times, almost. So there are three very fundamental areas. Resources -- now there are 63 very scarce resources that we need for our modern industrial society -- chrome and all the others that go with it -- that we do not have adequate supplies of in this country. And so those are fundamental interests on where those needs of a modern industrial society are going to come from.

So military policy cannot be made in a vacuum. Foreign policy goals should influence weapons buys, forestructure, and military alignments. So I think too often this Administration and the last -- the last two Administrations -- have too often gotten the military cart before the foreign policy horse.

Let me just digress a moment to give you an example of what I'm talking about. If the Soviets made a run at the Persian Gulf, which we were very worried about a couple of years ago, of course. They have a 450 mile supply line. We would have an 8,000 mile supply line. To try and take the Soviets on in the Persian Gulf head for head, tank for tank, gun for gun, man for man in the

Persian Gulf would be an almost impossible task. It would make
Normandy look like child's play by comparison, the logistic prob-
lem. But what if we told the Soviets that if you're dumb enough
to make a run at the Persian Gulf, why we will try and . . .
your forces there, of course, but we also want you to know we'll
close the North Sea, we'll close Vladivostok, we're going to cut
off trade and communication with you. And we have an agreement
to do that from our allies. Now, if you mean that and if that
really is a policy option -- and I'm not saying that's the way
we should go, but it's one of the things that should be con-
sidered -- then you make a whole different set of military pur-
chases pursuant to that option than you do if you're planning to
take them on head for head, toe for toe, tank for tank in the
sands of Saudi Arabia. And that kind of an analysis, it seems to
me, has to be followed across the board before we really, then,
know exactly what our military purchases should be, because we
want these purchases to support a well-thought-out foreign policy
on what the fundamental interests of this country are.

So we can't give just a blank check to the Pentagon without
considering some of these other matters.

Now, we can come up with some criticisms this evening of
things that we particularly don't like. There's going to be,
as I mentioned, a huge push on to save money out of the Defense
budget. I have supported a higher Defense budget in almost
its entirety. There are a couple of areas I think we can save
some money in -- I won't go into a lot of detail on these this
evening -- but we've got about $34 billion going into the MX pro-
gram and I'm sure that some people here are involved with the
MX program in one way or another, but that, it seems to me,
has turned into one of the larger white elephants we've had
looking for a zoo to hide in recently. If you buy the idea
that our ICBMs are vulnerable because they are at fixed geo-
graphic points so we needed to design a new missile to get
around that vulnerability, but we did not design the basing mode
along with it from the start, so we wound up with a 192,000
pound missile and we can't figure out where to put the thing
and they now have considered 30 different potential basing modes.
Now, the first five, as I understand it, are going back in the
same old TITAN holes that were too vulnerable to begin with
that started us out designing a new missile. The $34 billion
that we're putting into the missile is going to be small, I
think, by comparison, once we get done with whatever basing mode
we finally come up with, so we can probably add half again or
more to that. If we have to cut somewhere, it seems to me that
that would be one that I would not mind seeing go out the window
or down the silo, or someplace.

Another one that I've had some real questions about is the
rapid deployment force. Now, I don't take my objection to this
just because I happen to have spent 23 years in the Marine Corps.

The Marine Corps is going to be part of that rapid deployment force. It would be expanded; they would be the initial force, 82nd; the rest of them would come in on this thing. But the basics of the rapid deployment force are that we put a lot of supplies out there and have them pre-positioned so people can then fly in and use them. That's the way we'd prosecute the war in that part of the world. Well, it sort of defies military logic, as far as I'm concerned. It's the first time in all the military history I have ever read where we have proposed putting the supply lines and the PLO dumps out ahead of the troops and expect the stuff to be there and usable after the war starts.

So it seems to me that with these two programs -- if we have to cut somewhere, and I don't really want to cut anywhere in this -- but if we have to cut because of public pressure and what people have run into back home during this election season, then I would say those would be two places we might want to consider.

Now, we have criticism of other parts of the military that I would like to comment on. . . . . . and that somehow small is beautiful and cheaper is better and greater numbers are somehow more efficient in combat. I just don't agree with that at all because small isn't always beautiful and especially when it would force us to abandon the technological superiority that is our strongest asset. We do not have to match the Soviets with man for man being shot at, being placed in harms way. We do not have to do that because we are technologically superior and we can bring more fire power to bear with fewer numbers of people than the Soviets can. I think to say that we will just make smaller and smaller, simpler and simpler weapons systems just because there has been some writing about difficulties with the M-16 or difficulties with the M-1 tank or other weapons systems that have not performed perfectly -- and we always will have some of those -- it seems to me that to use that as the basis for now saying that we'll go back somehow to simpler warfare is just not realistic.

I remember back when I was in the Korean War days and following my Marine missions, I volunteered to go up with the Air Force on flying F-86s up against the MIGs -- they had one Marine slot in each Air Force squadron and I was picked to do that. I got up there and they were using the computing gun sight at that time -- big deal, wonderful. Didn't have to use a cross-hair type gun sight anymore and do skeet type shooting when you're shooting at an air target. We now had a computing gun sight. You put the pipper on and you tracked and that gave you exactly what you needed and that was great. Except for one thing. It had awful maintenance problems. Awful maintenance problems. A few of you here are as old as I am and you may remember some of those days out there. There were lots of pilots in the squadron I was in, the 25th Air Force Fighter Interceptor Squadron, who said, "The damn thing just doesn't work so often I don't want to trust it. I'll just go back to the old cross-hairs in

in the sight." And they turned it off. Now, there were lots
more of us who used it and got good results with it, got hits and
got kills with it, but the point I'm making is that people went
to work on that, which was a brand new, technologically-oriented
system in its time, and they made the thing work. Now, how long
does a gun sight, a simple old computing gun sight, go without
maintenance? Hundreds and hundreds of hours these days. It needs
practically nothing. It's as reliable as any other part of the
airplane. We worked out the problems is the point I'm making.
And now we're technologically superior in that area because we
worked out the problems. We didn't sit back and say, because
we have a little failure someplace, we now will put more
Americans in jeopardy in war by going back to a basic system
that does not take advantage of American technological superi-
ority to do things better and more completely than our adversary
can.

Perhaps the best recent example of where smaller is not
always better has been the argument over the aircraft carriers.
The purpose of aircraft carriers is one purpose -- to project
power, to project air power. Some people have lost sight of
that. They think a number of ships out there is a power projec-
tion in itself, but basically, carrier task forces are to project
air power at sea and to be used on a foreign target if necessary.
It's air power, and so your measurement of whether a carrier
task force is successful has to be the air power projection capa-
bility it has. Now, we've had all these arguments and I was on
the Senate floor debating hour after hour after hour in the last
session of Congress about whether we'd go to a smaller carrier;
do we go to the little carrier with fewer airplanes and is it
because carriers are vulnerable and because something was sup-
posed to have been proved out of the Falklands, which was a
fallacy. But we were supposed to go to smaller carriers be-
cause carriers can be hit. Well, any ship can be hit. That's
nothing new, and yet what you're trying to do is provide a
power projection of air power at sea. Well, how do the figures
come out? Let's just look at a cost analysis of it, what's
most effective. If you go to the small carrier, the 40,000
ton, it will carry about 38 aircraft. You might jam a couple
more on, but not many more. NIMITZ Class, the 90,000 ton, the
big carrier, carries 98. But that's not the question --
carrier versus carrier. Around this, you have all the support
ships and the protecting task force and the whole thing, then,
comes out somewhere around $12 or $13 billion cost for the whole
task force. And that task force for protection is necessary
whether you're talking about a small carrier or a large carrier.
And so you take the air power projection at sea, the force you
can actually project out there, and you divide the cost of this
whole task force by the number of airplanes you have out there
and you come out with the smaller carrier costing about $245
million for each plane that can go into action off this force
at sea. The large carrier, because of the greater number of

planes it can carry, $121 million to base a plane at sea. *So* your cost effectiveness is about 2 to 1.

Well, that's just one example of the kind of fuzzy thinking that I think passes sometimes for serious analysis when it comes to defense spending. I think we can, I think we must do better than that. I think we can follow four basic guiding principles. I think, number one, our existing forces must be the best and most technically capable, but they must be operable, ready, and sustainable. They must be operable, ready, and sustainable in combat. We can't have things out there that fail. But we can make these things reliable. Technical equipment can be made reliable, as you above all audiences I could possibly be talking to, know is the case.

Number two, the U.S. must construct a coherent foreign policy so we know what military equipment we need to buy to carry out our foreign policy.

Number three, I would change our defense budget presentation to the Congress and to the American people from weapons system versus weapons system to the force analysis-type presentation that some of you have been exposed to in the Pentagon, because we should not just be buying equipment on the Time Magazine or Newsweek type presentation, where the Russians have so many bombers in this box, we have so many bombers in this box; ours is a lesser number than theirs; obviously we need more bombers. Well, do we? Bombers don't go out fighting bombers. What we should be doing is a force analysis that matches up offensive weapons that we have against defensive weapons they have, and vice versa. Offensive weapons they have against our defenses here. That's what wins wars. That's what wins battles. My mind goes to the combat end of things and thinks if you're out there getting shot at, what do you need to counter. And you match up offensive/defensive and defensive/offensive, depending on which way you're going. So that needs to be a different way of presenting this.

Number four, we do need arms control efforts. I don't want to see us continuing to build just willy-nilly into the indefinite future. The nuclear freeze has focused a lot of attention on this. I don't agree with nuclear freeze. I put forth a five-point proposal of my own on that particular subject, the last part of which was that the nuclear freeze cannot be taken off in some sort of splendid isolation. It is part of arms, whether we like it or not. It can't be considered by itself. And we do need an overall arms control effort.

So those four points of existing forces operable, ready, sustainable, coherent foreign policy, defense budget presentation in different terms than we normally do -- do it in a force analysis type presentation, and arms control effort are four points that I think have to be very basic to us.

Let me depart just a moment into a little different area that
concerns me very much, but in which I think you also have a great
interest. I've been all over the country during this election
season supporting Congressional candidates. Economics -- big con-
cern across the country -- that's the primary concern this fall,
this winter, next spring. Obviously, if people are having prob-
lems making the payment on the house and trouble getting food for
the kids and the job, you can't blame them, but that is the major
concern they have. But in almost every stop, I've talked about
something else also that concerns me very much, where the trends
I think today in Washington are just flat wrong. It's the long-
term trends that are going to make this country or break this
country in competition with other nations in the future, as I
see it. Not just in a military way. If we could have a discus-
sion here this evening and I could say, are there things that
have made this nation great, that will continue to make this
nation great or second-rate, what would they be, I'm sure some-
one would say resources -- we had great resources, and we did
in this country. We've had great resources and all those things
we sing about -- fruited plain, purple mountain's majesty,
rivers flowing to the sea -- but we also have had some other
things that are along the more human line that it seems to me
are very important if we are to have this nation of ours in the
future in a leadership position in the world. Number one, we
started out with more emphasis on education than any other nation.
Everywhere Americans moved off the eastern seaboard, they put up
the little white schoolhouse, hired a schoolmarm, and some of
those little schoolhouses grew into colleges -- 139 colleges and
universities just in my home state of Ohio, a not atypical
pattern across this country. Out of this emphasis on education
for everybody, now -- not just for the kids that came from the
castle on the hill someplace -- education for every single
American became a right. Out of that came an educated citizenry
and an educated work force above anything this world had ever
seen before, and more people going on to higher education.
Then number two -- and this is the one I wanted to speak about
just a moment to this audience in particular -- we always, as a
nation, plowed more of our gross national product back into
research and inventiveness, innovativeness, inquiry into the
unknown than any nation in history ever. And we became the na-
tion, right from our inception, that did the new things in agri-
culture, the new things in manufacturing, new metals and research,
and much of this at government level. Businesses, by and large,
don't go in for the long-term research -- the 10, the 15-year
projects. Most of your companies are very happy to do something
that's going to be a 3- to 5-year bottom-line pay-off. Very few
go much beyond that. But in government labs, the Nobel laureate
type seminal break-throughs, are the things that came from
government-sponsored research. Then when these new facts became
available, we had the third element, which was free enterprise
entrepreneurship-type American capital being invested in these
things. Out of that came new businesses and industries and

employment and jobs, and you people right here are a perfect example of that in operation.

And now, what do we see? Well, we see cutbacks in higher education and several studies showing that this fall, for the first time, some of the kids from the least economically-advantaged homes are not able to go on to college. We had cutbacks in our national lab system last year -- 20 percent last year, 17 percent this year, some of the finest scientists in the world being laid off, projects being terminated. And I think that's tragic. This is all occurring at a time when the Japanese, the Germans, the French, and the others are beginning for the first time to out-compete us in certain selected fields. I still remain enough American to believe that we can still out-invent, out-compete, out-research, out-do anybody on the face of this earth if we just do it. But we're not going to do it if we cut back in education when we're in competition with other people around the world, or when we cut back in these areas of research that have been so basic and fundamental to America getting ahead and leading other nations around the world.

I hope we can sponsor more of that research. I have several bills in myself. They're not horribly expensive. We don't spend that much on research and compared to an $800 billion budget, it's not that much.

Let me close along a little different line. I think sometimes we talk about difficulties in this country until we sometimes build up almost jaundiced views or perhaps doubts about our ability to cope with our future as we have in the past in this country. I think sometimes those doubts become so pronounced and we become so critical of each other, particularly in our political talk back and forth, that we almost lose faith in what this country will be able to do in the future. I think we need to remember that this nation remains mostly what it's been ever since our founding days. It's been a beacon of freedom and of hope and of opportunity -- that magic word -- opportunity for every single American. Opportunity. It's not popular in Florida to talk about this, of course, but remember those horrible pictures of people on the beach here a year or so ago? Those were not Americans trying to get out of this country. Those were people who went to sea in boats, risking death at sea and lost, just trying to get on our shores because of the opportunity that they see here. I think we need to remember that and remember that as we talk politically back and forth, because I think we can be too jaundiced and too prejudiced sometimes to where we maybe lose our ability to work with each other for what is the long-term interest in this country. America's objective, I think, still is, if we could paraphrase Thomas Wolfe's famous quote, "To everyone their chance, to everyone their shining opportunity, to everyone the right to live, to work, to be themselves, to become whatever their talents, whatever their ambitions and

decisions combine to make them. That is the promise of America."
And it is. It's the promise of America. It's opportunity, fair-
ness, compassion -- a society in which none is left out. Moving
words, even in these cynical times, to me. The times of turmoil
and change and ferment are quite often, in our society, the times
of the greatest opportunity to bend whatever that twig is for
the future. Back 100 years or so ago, one of the leading essay-
ists, poets, leaders of political thought in his time, was Ralph
Waldo Emerson and he wrote some stuff one time, some things about
could America even survive, and with such a divisive society, so
many splintering things trying to go so many directions in poli-
tical thoughts and was a democracy really practical after all,
then he wrote words that I think perhaps apply better to us in
our day than they applied in his day. He wrote an essay as fol-
lows: "If there is any period one would desire to be born in,
is it not the age of revolution when the old and the new stand
side by side and admit of being compared, when the energies of
all men are searched by fear" -- doesn't that sound familiar
today -- "searched by fear and by hope, when the historic glories
of the old can be compensated by the rich possibilities of the new
era. This time, like all times, is a very good one if we but
know what to do with it." I would submit that all of us, working
together as Americans, can know what to do with it. You folks
here in this room are out on the cutting edge of that science
that I've talked about this evening. Keep at it. You're help-
ing defend our country. It's necessary -- working together.
Those opportunities can be just as solid for Americans in the
future as they've ever been in the past.

Thank you very much.

SESSION VIIB

PROJECT MANAGEMENT PANEL

Brigadier General B. J. Pellegrini

Let me welcome you to the session on project management. As you can see, I'm wearing a green uniform and I should sort of set the record straight right away. The other day at luncheon, the Admiral from Canada talked about the cost of brains and the fact that Army brains are never used and therefore they cost $25,000. He's talking about the Canadian Army, not the U.S. Army. But since he's an Admiral and I have an Admiral up here in front, I am reminded of a story about the three Englishmen who were on the train. They left London and one of them thought to himself that it was going to be a long trip and thought he should break the ice and introduce himself. After they pulled out and they had gone some way, he said, "The name is Sutherland. I'm a retired Admiral, married, two sons, both lawyers." The next gentleman said, "The name is Wharton. I'm a retired Navy Admiral, married, two sons, both doctors." The third gent figured it was his time to tell who he was, and he said, "The name is Smith. I'm a Sergeant Major, retired, not married, two sons, both Admirals."

You can see from the subject here we're going to talk about program management, and that's a big subject. I'm not going to stand up here and try to suggest to you that in an hour and forty minutes we're going to cover all aspects of it. But I'm hoping with the people that I have on my panel that we'll give you different views, if you will, on program management, and before I give you an overview of what I want to say, let me just take a moment and introduce who I have with me. The first gentleman here is Peter Zimmerman. He's an Assistant Dean at the Kennedy School of Government, Harvard University. Peter is a native of Chicago. I understand he was raised in Virginia, and he's got backgrounds in working with agencies in the Government and, if I understand, Peter, your mother is here. Glad she could be with us.

Next to him is a Naval grad, 1958, George McAleer. George is a native of New Jersey. George heads up my laboratory on management at the Defense Systems Management College, and he'll be giving you a presentation on how we use simulation in computers to support us on the decision exercise.

My third member is a high-priced Colonel here, who is taking care of the vu-graphs for us, Dana Brabson. Dana heads up my Department of Research. He is a native of Washington, D.C., and Dana's got extensive background in both research and development and academia in the Air Force. Dana will be telling you a little

about the Acquisition Improvement Program, formerly known as the Carlucci Initiatives.

As far as me, I'm Ben Pellegrini. I took over the College in January of this year.

(Due to technical difficulties, a portion of General Pellegrini's remarks was not recorded).

That's my mission. A three-fold mission -- top one, educate. We educate people both within the Department of Defense on acqui- sition management and also industry. Second and third missions, there, research and also dissemination of information.

I have to give you a wiring diagram. That's how I'm organized. I've got 167 people on my staff and faculty. I've got an annual budget of about $7 million. I've got many bosses and I'll tell you who they are, up there in the PGC, and also I have a Board of Visitors. As far as my departments here, Dana Brabson, who is with us, heads up my Department of Research and Information. I have a Navy Captain who heads up the School of Acquisition, and my Department of Acquisition is an Army Colonel.

Here my bosses are. I work for Dr. DeLauer and you can see the other members there -- Admiral Williams, our keynote speaker, is one of my bosses. I just had my show and tell with him a couple of weeks ago on resources. And if I say nothing else this morning, I certainly underscore and endorse what Admiral Williams said. It's what the College is on, and that is we have to build systems for the sailors, soldiers, marines, and airmen that are effective and win on the battle field and are affordable. It takes in all aspects, and I know this community here is basically in the training and simulation, and if I say nothing else, you people have to make sure that we program managers know what those requirements are early on so that when we put together our acquisition strategy, we effectively cost them and put them in there. Having been an old PM, I can assure you that when it gets going tough, you trade off a lot of things that are in the rubrick of ILS, because you're trying to get that design to work.

Board of Visitors -- people from academia, general business; the present chairman is Dean Keech. He's up at the Wharton School of Business.

Let me tell you what we do. I've got 17 different courses right now, shown here. My primary reason for being is the PMC, Program Managers course. I'll say a little more about that. I also have courses for flag rank for 3-1/2 days, and then the executive refresher course. I should say, my goal has been to ensure that I get 10 percent industry in all of my courses. We do

not charge tuition and I'm often asked by people why we don't. I
argued with my bosses that the experience we get, we in the Govern-
ment, either wearing uniform or civilian clothes, that we share
with you in industry is well worth any tuition that we would try
to charge you. It's a very productive and a very useful experi-
ence.

Other courses are shown here -- 17 in all. It does cover
almost all of the major aspects, if you will, of program manage-
ment. I'm going to go through fast. If you have a desire for
more information, please get hold of me or any of my people here
or come on by and see us in Washington.

I have a regional program. Our plans for FY 83 are shown here.
In FY 84, I plan to establish four permanent sites throughout the
country: one in Los Angeles at the Space Division; one in St.
Louis at the Aviation Command; one up at Hanscom; and one in the
Missile Command at Huntsville.

This is the type of student that goes through the Program
Managers course. You can see the quality there. Typically, six
or more years of experience, a Masters, tremendous resource. I'm
happy to say that my second PMC class since I've been there, I
really see the Services taking very seriously the necessity to
send people with the right kinds of backgrounds and also with the
view that when you send someone to this course, properly utilize
them. We're not quite there yet in all Services, but I would ex-
pect in the near future that many of the Services, when they send
people to the PMC, it is with the view that these people will be
the ones that will be taking over Program Manager jobs or working
in Program Manager offices.

As far as my speakers, just to give you an idea here, we get
many people from different positions within government. This
happens to be our guest speaker for the current class -- they're
graduating in December. In addition, we get very good support
from industry.

One thing I started when I took over the schoolhouse was that
I wanted more realism in what we teach at the school, and I have
emphasized a closer link with industry and with the field. So
what we have started in the current class is the industry program
and we formed different sections of about 20 to 25 students and
they go out and visit, in the course of the 20-week class, differ-
ent industry sites. They go through a program review with both
the Government PM and the contractor PM, again with the view of
seeing what the issues are that Program Managers must face today.
In the current class, these are the programs we visited. I know
some of the contractors are represented here.

In addition, we put together a trip for my industry students
so they can visit government installations to more enhance their
understanding of what the Government is all about. This is the
trip that the students went on in the current class.

Here are our plans for the class that starts in January. The classes run on the order of 200 students and from the information I have, we're going to have ᴊout 20 industry. My goal is 10 percent, so we're going in the right direction.

What I want to show you here is that in that 20 weeks, we go through many of the disciplines shown here. This is simplified, but the academicians tell me that when you expose students to many disciplines all at the same time -- and that's what this vu-graph is trying to show you, that in any given week down here, you as a student would be exposed to policy, business, tech, and our lab all at the same time -- that we may not be effectively utilizing them and getting the most out of it, so our plan is to go from that structure to a structure shown here where students will enter into, during their 20 weeks, specific blocks. You'll finish a block on business; you'll then go to tech and to policy and so on. This is with the view of growing into this kind of way of doing business in the 84-85 time frame. What this represents is the ability of the college to have a surge capability, to educate more people in the acquisition business, and to do it, sort of keyed down here in the lower part of this chart, looking at different experiences of the students. So what we are attempting to show here is that if you, as a young civilian or officer coming into the acquisition business, you could start down here on basic courses and transition all the way on up to the executive and flag officer courses.

That's just to show you that we haven't lost the current short courses I had. They're going to be merged into functional courses. Another way of just showing that when I finally get into my new way of doing business, I'll have the courses shown over here.

On research, I do have a modest research -- all I want to show you here is that we are looking at what I call today's issues and tomorrow's problems. Colonel Dana Brabson is my Dean of Research, and what we're looking at is case studies; we're looking at ways that we can influence the acquisition process. We do interface with many study groups, steering committees -- for example, one of the under secretaries, Bill Long, heads up a steering committee looking at how to more effectively implement the Carlucci initiatives, or the Acquisition Improvement Program. We work very closely with him and this is some of our activities that we plan to do, currently on contract and planned.

I have two key publications. Some of you may have received the Concepts over there. That's our latest issue. We typically distribute 8,000 copies of Concepts. This one is pushing 14,000. It addresses many of the aspects of the acquisition program, a lot of fine articles, both from authors within the college, and also industry and academia.

Just to show you that we are getting into the ADP area -- George will talk more about the decision exercise -- in 1983, I'm going to establish a net within the college so we will become

familiar with keyboards and CRTs and start doing some administrative functions. But I really have a problem, and that is when I think of all the information that the PM of tomorrow's going to have to manage, someone is going to have to be able to sort that information out so that he or she gets the relevant information at the right time to make the right decision. And that's not an easy task. Along those lines, I was watching the Today Show this morning and they reported that a group of scientists are predicting by the year 2000 that computers are going to create more problems than they will solve. That's sort of mind boggling.

Now I'd like to turn the meeting over to George McAleer.

Mr. George R. McAleer, Jr.

That's going to be a tough one to follow.

I've seen several Program Management Course graduates the past two or three days. I see Jim Horton sitting right here -- he spent 20 weeks with us last spring -- but I'd say we have 7 or 8 graduates of the course. What I thought I'd do is spend a little time here with you expanding on what General Pellegrini talked about in the Program Management Course and how it pertains to some of the things, possibly, that we've seen over the past few days.

What I want to point out is that our Program Management Course, and you saw the slide a few minutes ago that General Pellegrini had up there, you'll notice on the left-hand side we have a Policy Department and a Business Department, and in the upper right, an Engineering Department. There are about a dozen courses that we have -- we call them functional lectures -- and they approach, if you will, what most of us have experienced in learning. That is, I talk, you listen. Now, how do we tie that all together, because we can't have students leaving the college who understand these incrementally or individually. Notice on the bottom right-hand side -- and maybe the word "integration" on the right-hand side ought to be in quotes; it's really the acquisition management lab -- but it really is the Integration Department at the college. And we have three specific functions. I'm not going to talk about the one on the bottom, that is, the Student Decision Briefings. We call Student Decision Briefings "the pits." What it really is is a 15-minute presentation by a student to get a decision from a senior official, and we use a particular model for that. But what I would like to touch on momentarily are the case studies, and then more specifically, the decision exercises.

The case studies, there is a series of 20 of them. We call them "System X." It's a hypothetical or a mythical system, but it is based on the AIR LAUNCH Cruise missile. Now, the decision exercises follow this same pattern. That is, taking the acquisition life cycle and we divide it up into the three basic elements of the acquisition life cycle. They also follow the format

or the acquisition process -- we use the AIR LAUNCH Cruise missile as a vehicle.

Now I put the acquisition life cycle up there. It's critically important to what you all do, and we use this as a means for integrating -- keynote word -- integrating some of those functional courses we displayed a moment ago. What we're going to do here this morning for the next five or ten minutes is to take a segment of that life cycle; you saw that we divided our decision exercises -- and by the way, the decision exercises is a simulation broken up into three parts; that is, the concept development phase, the one you see over on the left-hand side; then a demonstration validation phase; and then lastly, the right-hand half of that chart is the last of the three decision exercises. We ask students to make specific decisions to grapple with the complex issues that one has to, in the real world that you and I live in.

If some of you are wondering why the program go-ahead is quite a bit wider than that requirements validation space, for those of you who have looked into acquisition policy -- and why the empty blocks on the old Milestone Three and the Milestone Zero. Well, if you really have a question on that chart right there, and being that you're in the business that we're collectively in, I would suggest you take a look at that special issue of the Concepts magazine that the General referred to that Colonel Brabson and his staff put out last summer. By the way, there is an excellent article and I would suggest you take a look on it on page 83 of that particular issue. Now, modesty inhibits me from suggesting who the author might be of that article, so I will continue on.

The name of the game in the decision exercises -- we want to reinforce what a student has learned in the functional courses -- those that are presented to the student in the Policy Department, the Business Department, and the Technical Department. And we do it through the System X cases, but more specifically, and what we want to talk about this morning, in the decision exercises.

Now, any educational institution has desired learning objectives and we do, too. We want the students to be able to work with complex issues. We want them to get an understanding of the inter-relationships of the organization that become specifically involved, directly or indirectly, in the acquisition process. And lastly, we want the student to have the capability to make a commitment, to make a decision.

I've taken one of the decision exercises -- we mentioned we have three -- as an example that we'll just chat about here this morning. It's decision exercise #1, and we ask students to individually and then collectively work on this. And you notice the four elements that comprise this exercise. Like any good educational institution, we have goals and objectives. Now, we want the student to be able to get -- picture in your mind the chart you saw a few minutes ago of the acquisition life cycle -- we want him to be able to get from the old Milestone Zero, and

for those of you who still think Milestone Zero is a big thing and it's in, it's out -- it was out last spring; we call it by a different name, now, but I won't go into that. We want him to be able to get to a Milestone One, that is, a DSARC decision, within the dollars allocated, and selecting or having selected the right alternatives.

There's one of our own working individually at this. Now, he's going to spend somewhere between two and four hours in preparing for this first decision exercise, and we work it in three units. That is, individual preparation, group preparation -- and the group is our basic core element at the Defense Systems Management College comprised of five to six students, and we'll touch upon that in a moment. Now what does that student, in preparing for this simulation, doing? Remember, he's had much of his functional training behind -- let's say he's a third of the way through the course now. We're going to ask that he take a look at the requirement, come up with some idea of funding about people in this mythical program office, and then scheduling the tasks and activities that will get him from this requirement, or the inception of the program, to his first decision at Milestone One. It's going to take him two to four hours to get it done, but the real learning starts to take place after this individual preparation when the group gets together, these six people. And they're going to haggle out what they've come up with individually. Now, this is where the action really takes place, in this 6-person group.

The first item -- now, if the justification for major system new start is a new term to you, you might wish to take a look at the new Department of Defense Directive 5000.1 and the Instruction that goes along with it, 5000.2. If you're asking, "hey, where's the Mission Element Needs Statement?" Past tense, gang. That's old stuff. That changed last spring. So the justification for major system new start is it. Now, what we want the student to be able to do is take a look at the various factors concerned or involved in a justification major system new start, and to select out the ones that he thinks are critically important, based on the scenario he read the night before.

Second item of the four he must do, individually and then decide upon and get group consensus, is the funding profile, and he's got to come up with a five-year plan from a dollar and cents point of view. When they start talking about money, students get down to serious business. How about the people? What kind of people am I going to be required to work with, to have, in order to make this program operate? What kind of management people do I need? Technical? Military, civilian? We ask that this be, again, based on the scenario presented, what kind of people do I need? What kind of disciplines should I have onboard? When should they come onboard? Do I need them all right away? These kinds of decisions this group must make.

Lastly, you've got the requirement, you know how much money you think it's going to take -- that is, for this first phase as

well as for the total program -- you think you know how many people you need, what tasking activities are required in order to get from inception up to the first Milestone? Now, if that student or that group of students does it right, this is what they'll end up with. And I would suggest that it doesn't always come out quite like this. Notice that we're working in the 1979-1980 time period. We're running 18 months, and the bottom line item is a DSARC 1.

Okay, so you have a rough idea of what the students, individually and collectively, have to do in preparing for the simulation. Now, we can work with 16 of these 6-person groups at one time, and what they will work with here is a keyboard terminal, CRT, and a printer you can see just off to the left there. There are two of these in each of these classrooms, along with the printer, and the two CRTs and the printer have the readout, that is, the simulation itself, accomplished simultaneously.

Faculty members are able to observe up to four rooms at a time with this little dial switchbox, and they can see what each of the student groups are doing. We find it's much more beneficial for faculty members not to necessarily be involved directly in the classroom, so they can observe through an observation center just what is going on.

We said that individually and collectively, the students have prepared this data and the information. The first thing they're going to do is through a prescribed format, enter it into the computer system. Now, the exercise itself. Assume that the justification for major system new start -- . . . is the term that's bantered about as being the acronym or abbreviation for that; it's been approved -- and the students are going to take on the role of being the Program Manager. They're going to have to make the right kind of decisions as they go down this 18-month period to the first Milestone. Assume that the initial staff is onboard, they've got office space, secretarial help, and they have five people. The objective is, what is the best solution or solutions during this concept development phase, and to prepare to brief the defense acquisition executive at the first DSARC. So now they've loaded this information, or a portion of it, into the computer. The first thing that comes up are activities and tasks and through this simulation, the student is going to be provided with information; he's going to be asked to make decisions or problems will be posed to him. Now, I would suggest, and in this time here we don't have the opportunity to go into great detail, ... is an expanded version of what I'm chatting about here and you can see some of the detail of the simulation as to what the actual printout would look like, what the student is seeing on the CRT or the printer.

One of the first things that the student will be asked to do is input the people that they've come up with in the group consensus, that is, do we have additional staff required to the starting five people I mentioned a moment ago? What are the costs

required in getting both military and civilians onboard? Are
there procedural delays in getting people onboard into a program
office? The obvious answer is yes to that. So by experiencing
this first hand, we find that the student learns, as opposed to
someone telling him, "here's what you can expect to happen."

The one thing the students can do is in many cases they'll be
of a mind to, "look, we only need 10 people to run this program
office and that's it," and the simulation will allow too few
people. Now, if someone were to say, "I'd like to have 400 people
in my program office," the simulation will penalize them and bring
them back to go and he will not collect his $200 and he will start
again on the number of people until he gets down to a manageable
number.

He's going to go down all of the activities, taking them as
they come, running down to -- and it's going to take approximately
three to four hours to go through the simulation, and again, I
refer you to the proceedings for the detail in the simulation --
The one thing that we do encourage the students to do over the
three to four hour period is to vary and alternate their positions;
that is, for someone to act and actually make the decisions as
the Program Manager, and others to be the Technical Director and
the Program Controller. As a matter of fact, you can see the
Program Controller's activity up on the blackboard there. The
role of the faculty member, as we indicated, is to sit in that
operations center and observe passively what's happening. Now,
he does become quite a bit more active in the de-briefing, which
we see right here. He is providing to the students by giving
them an opportunity to see, after they've gone through the three
to four hour exercise, where they've come up short on some of the
tasks; where they located them; their cost, schedule, and perform-
ance activity.

What we've done is we do have a little bit of a competition
among the students, and so it's not specifically specified if
you had a 7.2 or a 91%. We use an SAT, if you'll go back to some
of your high school teenagers, SAT scores running from 200 to
800, with the norm being about a 650. We've had some student
groups go into the mid-700s, and that gives them a point of com-
parison as to how well they did versus some of the other groups.
I should add that it seems that with the problems we introduce
in this simulation, most folks gets to the end of that 18 months,
that MILESTONE ONE, that DSARC, running about 10 to 12 weeks late.
But we do introduce significant problems which might be considered
out of the ordinary so that learning really takes place.

Let me back-pedal for just a second here, just to remind you
of the same slide we showed a moment ago. The object of this
simulation is to tie together the dozen or so functional course
elements in Business, Policy, and Technical that the student has
acquired over his 20 weeks at the college.

I'd like to conclude, or wrap this up, we find these three items, which I'll expand upon in a second, and it takes place in both the System X cases, the 20 of them, as well as the decision exercises. The students typically come to the college and they are overwhelmed with the amount of information that they must digest and assimilate, particularly in this quasi-case study or simulation environment. Phase Two is that students realize that if they don't pool their efforts, they're just not going to make it through. Most folks think they come to the Program Management Course to drink out of a water fountain and unfortunately they drink out of a fire hose. But unless the efforts are pooled, and that's why we work in 5 or 6-person groups, this is where the learning really takes place, that is, the exchange back and forth.

The last of this dilemma is resolved near the end of the course when the student realizes, through some of this experiential learning, that he has as good an answer, as good a response, as any instructor would have and that his solution to any particular problem is as good as any other and that's what we want him to walk back with into that real world.

When students finish the decision exercises, as well as the Program Management Course, we have a bunch of smiles that you see right here. But they've really found that, in that 20-week program, they've learned something and it proves to be very helpful in their environment back in program offices.

That's got it on the decision exercises and I'll be happy, a little bit later on, to touch on any questions you might have along that line. Thank you.

Mr. Peter Zimmerman

General Pellegrini, you really don't charge tuition? Well, I'm from Harvard and we charge tuition. Out there in the private sector, it's rough.

I wanted to recall Senator Glenn's remarks last night that I think a lot of you heard. His concern, his emphasis on our technological superiority is kind of a bedrock of our security in this business. I agree with that, and like him, I'm concerned that that bedrock is at risk. I don't think he was frank enough last night in laying it on the line and I don't think President Reagan was frank enough in New Orleans when he said that fixing potholes is not the cause of our huge budget deficit. We face some very tough choices in this society and everybody is going to have to give a little bit. General Pellegrini's points about the need to control costs, delivery systems, on time, on schedule, on cost or maybe even under, if that's possible, is a theme I'd like to hang with and try to toss out some provocative ideas and see if we can get some people to argue a little bit.

Let me illustrate the point about tough choices. What was the figure Senator Glenn used last night -- a couple hundred billion

dollar budget deficit staring us in the face? Take social security,
Medicare and Medicaid, interest on the national debt, and the De-
fense budget. Add it up, shut down the rest of the Federal Govern-
ment -- you could just about balance the Federal budget next year.
Just about do that. Just with those programs.

Now, all that means is, we'll set aside food stamps; we'll set
aside welfare and unemployment benefits; close down the national
parks, the national forests; the FBI; the Weather Bureau; the Census
Bureau; Bureau of Labor Statistics; may have to close the Custom
Service, the FAA, maybe even the IRS, but we better not do that or
we won't have the money to finance this. Well, that's not going to
happen, is it? It's not going to happen. Are we going to ravage
the Social Security system? The social contract we wrote 40 or 50
years ago? We have to do something about it because it's really in
crisis. If we continue the benefit levels and the way in which we
increase benefits under current law, when I get around to retiring,
I'm going to be paying 25¢ of every dollar -- off the top -- for
those of you who are then retired. I don't want to do that. So
we have to do something about Social Security.

Interest on the debt? Can we stop those monthly payments? I
don't think so. Otherwise, they'll take away our national Visa card
and then we'll really be in deep stuff. So we have to look to
DOD as well. We've got to look to the Defense budget. There's no
getting around that. Promises of 7 percent real growth are just
that, but they're hollow. Maybe for a year, maybe for another
year, but in the end, we've got to squeeze that Defense budget
just as tight as we're squeezing the rest of the Federal budget.

This big business that we operate, this quarter-trillion dollar
operation, has had some pretty good guys at the top. I thought a
little bit last night about the people who have been Secretary of
Defense since John Glenn circled the earth 20 years ago. People
like Bob McNamara, Clark Clifford, Melvin Laird, Elliot Richardson,
Harold Brown, and Harvard's current favorite son, Caspar Weinberger.
He's a graduate of both our college and law school and a member of
my school's Visiting Committee. Those guys are about as good men
as this society produces. They are first rate. Intelligent,
capable, dedicated, hard working, men of high character -- they
are about as good as you get. They're kind of the CEOs, but not
quite, of this big corporation.

Where is the problem, at least as I perceive it. I think it's
in middle management. We don't have a good middle management
cadre, and that's what this particular session is focused on -- the
Project Managers, the middle managers, the guys who operate the cost
centers and the P&L centers, the Profit and Loss centers in this
great big corporation. Now, they've got a very tough job. George's
focus is very much on trying to help them pull together the dis-
parate strands that go to make up the design, development, produc-
tion of a complex weapon system. Integration, he stresses. I think
that's exactly right. Think a little bit about the character of

the kind of jobs these guys have. Their own technical training may
have been kind of scanty, but they're now working at the leading
edge of technology in many areas. Their own training may be five,
ten, fifteen, even twenty years old. It may not have been all that
strong to begin with. Technology has changed dramatically and
they've got to wrestle with some very complex technical issues.
They've got to relate what they're doing to the things Senator
Glenn was talking about last night -- the national security inter-
est, the foreign policy interests of the United States -- that's
the dog that shouldn't be wagged by the tail of technology, but
we've got to relate what we're doing to our broader military ob-
jectives, our broader foreign policy objectives.

That's kind of hard to do. In business education, you talk
about business strategy. What business are we in? What are the
products? What are the markets that we're doing? Corporations
have ways of deciding that. They think about that. CEOs make
those decisions, but who makes those decisions for government?
Who makes those decisions for the Department of Defense? Is it
the Congress? They play a role; they get involved from time to
time. Is it the Secretary of Defense? Well, some things, yes.
Is it the Commander in Chief at the White House? Well, yes, a
little bit. Is it the Project Manager? Well -- they're sort of
all in that game, aren't they? And it's not always as neat and
clean and progressing from step one to step two as the charts would
suggest, as those of you who work in this business know. It's much
more like a bunch of players in a game and the whole field is mov-
ing back and forth and the ball is rolling this way and rolling
that way, and you think you've got one problem solved and it comes
back and bites you again a year later. Think of how many times in
the last 10 years have we been about to have a definitive deci-
sion on the basing mode for the MX. We've got one more coming up.
This isn't going to answer that question. Yes, you have decision
points, but decisions are always fair game in the public sector.
That's the nature of the game we're in. It's a tough world.
Project Managers have got to relate to that, he's got to under-
stand that environment -- the political environment, the social
environment, and the economic environment -- and relate the tech-
nical concerns we talked about a minute ago. He's also got to
deal with some of the folks who are here in this room -- industry.
He's got to deal in sort of a funny, sort of a schizophrenic kind
of way in which government approaches industry.

On the one hand we use these things called contracts, based
on our legal system and the notion that one thing is given for
another, that a controlling bargain can be struck. When I was a
kid, I'd go out and shovel snow and someone would pay me five
bucks and they could tell whether I'd done the job or not. If
we tried to write a contract to do that according to the Defense
Acquisition regulations, do you think you could do it in less
than 100 pages? I don't know, I don't think so. It would be an
interesting challenge. Think about that.

It's a system that is based on an adversarial relationship, the legal system, the ideas that underlie contract law. Yet we're trying to do things in which industry is very mucy an extension of government. We're supposed to be working on the same side of the fence, not adversaries fighting with one another. We're not very imaginative -- I say "we," I mean people like me and others in academia -- thinking of better ways of defining that relationship, of understanding it, of regulating it and making sure that folks on both sides get a fair shake, both public and business.

It's quite a mess, and Project Managers have to pull it all together. That's George's stress and it's our stress, too. In business education, one of the advances of 40 or 50 years ago was to focus on what is called the general management point of view. That's what they teach at the Harvard Business School and lots of other business schools around the country. Why is that? What is that important? Well, first of all, I would say that I am delighted to see that General Pellegrini and the folks at DSMC also think that's important, and that's very much the focus of the management lab and the other integrative exercises they do. But if there's one thing that we've learned about large, complex organizations, it's that the hardest problem is going to get everybody pulling in the same direction. I mentioned to George that I read a story in Business Week on the way down about TRW, a sophisticated, successful corporation. Any of you who might have seen it may recall that the number one issue they're concerned about is how to get the various divisions pulling in the same direction. Their technologists aren't contributing to production, different people are going off in different directions. There are a bunch of fiefdoms that aren't well coordinated and aren't well organized. Well, what do they need to know? The subordinate managers need to understand the general management point of view. They need to understand the environment; they need to understand the strategy; need to understand what the boss's view of the world is, what the boss's problem is. That's something that we try to teach, that DSMC tries to teach, and it's very important. It's a central strand in our educational approach at Harvard. Now, I'm not going to stand up here and tell you much about what we do, but I do want to make one other point about what we do and the way we approach this problem. Like George and General Pellegrini and Dana and others at DSMC, we try to focus on the real world, as well. We use a lot of management cases, some simulations, though they're not quite like the kind of simulators that are in the next room. But we like to write cases about real people, real situations -- they're complex, they're messy, they don't necessarily conform to some academician's view of the world as it ought to be so he can make a particular point. We've written a bunch of cases about Cap Weinberger, among others. The reason we do that is because we think you've got to begin with the manager and the manager's problems -- who the manager is, what the issues are, what the environment is, what his support is, what his objectives are, what the capacity of his organization is -- to accomplish the objectives that are set out.

How are we doing at all this, anyway? By my senses, we're not
doing too terrific. Indeed, I'd say that we're doing quite poorly
when it comes to the education of Project Managers. The creation
of DSMC a little more than a decade ago, I think, was a great step
forward and the programs that they've run and designed are very
much a step in the right direction. But if I look around schools
like mine, schools of management, schools of business, schools of
public affairs, we're not doing very well. Why is that? Well, let
me give you one particular example.

I mentioned our heavy use of cases. Over the last 15 years,
all of the schools of management and public affairs have produced
something on the order of 500 or 600 cases about all dimensions of
public policy, public management, whether you're talking about
operations of local school districts or water programs, defense
programs, whatever. The business school that sits across the river
from me, also part of Harvard, produces that many cases every year.
Literally, in order of magnitude, difference in the production of
cases. Why are cases important? Because no one managerial situ-
ation is going to be like any other. They're going to be unique,
they're going to be different -- different people, different char-
acters, different actors, different problems, different environ-
ments. You need to continually go out, and schools like ours are
trying to do more of this, going out into the field, talking to
managers, finding out what their problems are, documenting what
they're doing well, what they're doing not so well, and then
bringing that into the classroom to get experienced people to
argue about that.   If I had my druthers, I'd walk away from here
with a check from General Pellegrini or maybe a check from some-
body else to go write 50 or 100 cases on project managers every
year. It wouldn't cost very much -- a million dollars or some-
thing like that, maybe two million -- we'd write expensive cases.
A few thousandth of one percent of what we spend on the acquisi-
tion of these systems, so we could better train the people whose
job it is to go out and buy it. Not a bad notion. Not something
we're doing, but something I think we ought to be doing. It's the
kind of thing I think we need to do. I started out in the Navy
Department. I worked on the weapon system end of the POLARIS,
POSEIDON, and TRIDENT programs. The people who worked on the ship
driving end, the people who worked for Admiral Rickover -- he put
them through an extraordinary training program. I've seen one or
two people with dolphins on here over the last few days. Eighteen
months on dry land before you even touch a real reactor, working
with simulators and things like that. And several other years,
working your way up -- Engineering Officer, XO, things like that,
before you're qualified for command of a nuclear submarine. We
don't do that kind of education for our project managers. We
wouldn't dare turn somebody loose with less than 10 or 15 years of
serious education and training to command a $200 million ship and
120 officers and men. Yet we send guys out with about 6 months
worth of training that is very good training that they get at DSMC
and not much more than that, to command billion dollar programs.
Thousands of individuals. Until we begin to grapple with that,

until we begin to improve that process, we're going to still have a lot of problems.

I hope I've provoked a thought or two and we can argue about that in a minute. Dana, you're on.

Colonel G. D. Brabson

Thank you, Peter.

Before I get started, I'd like to calibrate the audience. I understand the General is going to have a little quiz at the end of the session and if you don't pass, you have to go through a rerun. How many chemists are there in the room? I have a particular affinity for chemists. Any chemical engineers? I was hoping that somebody would get to validate my part of the course.

What I would like to do today is spend just a few minutes talking about the Acquisition Improvement Program and then just a couple more minutes talking about a couple of insights into the future. The reason I want to do this is because it ties together an awful lot of thoughts that the General, George, Peter -- as a matter of fact, the first session this morning also encompassed and talked about. In a sense I'm going to provide you a little bit of a wrap-up.

It's quite clear that when Mr. Carlucci took office as the Deputy Secretary of Defense nearly two years ago now, that the Soviets had amassed a significant numerical advantage with respect to weapons systems. And that there was a consensus within the country to rebuild our own defenses. The Deputy Secretary of Defense was also keenly aware of the fact that that consensus could be quickly eroded if the confidence of the American people was lost. He also recognized that in order to sustain a real growth in the Defense budget over a number of years, it was going to be necessary to cut out other programs. That's what Peter was talking about, particularly in the social area. As a result of that fact, there were going to be people looking down our throats and checking on us very carefully to make sure that we are, in fact, good stewards of the resources that have been provided to us.

To establish that claim of confidence, the Deputy Secretary of Defense set in motion the Acquisition Improvement Program, and he told our students at the Defense Systems Management College about 1-1/4 years ago, "We need to move vigorously in four areas. The first is a capacity to articulate a comprehensive strategy and to plan against that strategy. Second is a demonstrated capacity to make tough choices and to set priorities and, yes, to kill programs when necessary. Third is a capacity to achieve savings and fourth is the ability to get our weapons systems' cost and lead times down." These are the challenges that were taken on by the Acquisition Improvement Program, and over the past 1-1/2 years, there has been vigorous activity to meet those challenges.

The Acquisition Improvement Program began with tasking on 2 March by the Deputy Secretary of Defense. He didn't need any more studies. What he needed was to take a look at the studies that had been done and make decisions and get on with it. So he gave them 30 days to take a look at that and get back to him with the recommendations, and he made his decisions and published the first 31 of them on 30 April and he published the 32nd decision on 27 July.

Perhaps the best way to quickly synopsize the Acquisition Improvement Program is to look at the fundamental management principles which are outlined at the beginning of the 30 April memorandum. First at the very top, as we mentioned earlier, the emphasis on developing the strategy and the plan. And the second part of that, then, is once we have developed the plan is to develop the discipline to stick with that plan, and you see elements of that here. Accountability -- to hold people accountable for the plan that they have signed up to. The discipline to allocate the resources in a manner such that the programs which have been laid out can be efficiently prosecuted and executed. To manufacture at economic production rates; the discipline to hold the rate at an economic level rather than cut it back to sub-economic. And the discipline to budget realistically in an environment which encourages liars' dice, if you will.

Other elements -- evolutionary low-risk alternatives. That translates into pre-planned product improvement. I'll talk about that in a moment just briefly. The two at the bottom dealing with the industrial base -- the concern with the weakening and aging of the industrial base and the strong intent -- as a matter of fact, the strengthening of the industrial base or industrial base preparedness is one of the three major efforts within the Department of Defense today, and competition, of course, complements that and facilitates that process.

But the one I want to focus on today is improved readiness, because after all, that's where the business of training equipment really fits in. It is part of the ILS; it is part of the basic business, as was pointed out just a moment ago by the General.

. . . . . And so, let me read to you the strong words that were put against this particular bullet right here on improved readiness. I will quote from the 30 April memorandum. "Improved readiness is a primary goal of the acquisition process, of comparable importance to reduced unit cost or reduced acquisition time. Resources to achieve readiness will receive the same emphasis as those required to achieve schedule or performance objectives." I'd like to report at the outset that in fact, at the OSD level, that is happening today. The resources are being given additional, greater, even equal emphasis with resources for other things and we are seeing budget decisions coming down which in fact positively affect our capability to maintain systems in the field.

The next four charts deal with this subject in just a little
bit more detail. What I've plotted on this chart is the percent of
life cycle costs as a function of program status. And I draw your
attention first to the line which describes how we expend money.
Well, we expend about 10 percent of our money getting to the pro-
duction point, and another 25 percent or so in production, and
fully 2/3rds of the cost of a program are involved with keeping
that system in the field. That's where 2/3rds of the life cycle
costs are. This is for a typical system such as an aircraft or a
tank or something of that sort. But we make commitments to those
resources much earlier in the program. If you take a look at this
other curve here, by the time you reach the first milestone, you've
already committed 70 percent of those resources and by the time
you reach program go-ahead at milestone two, 85 percent of those
resources are committed. By the time you reach the production de-
cision, 95 percent of those resources are locked in concrete and
there's nothing you can do, either about the distribution of those
resources among the cost elements or the absolute value of those
resources that you're going to ultimately have to expend on that
program. Those are the hard facts of life.

What does it mean? It means that up front you've got a tre-
mendous amount of leverage. For small expenditures up here, you
can make tremendous impacts out here. But if you delay until later
in the program, your leverage goes away in a big hurry. You must
establish -- we must establish our readiness objectives right out
here at the beginning of the program. That enables us, then, to
develop the strategy for achieving those objectives by milestone
one. Why must you do it that early? So that you can in fact de-
sign reliability, design supportability, and add in the word there
design training, because that's all part of the same baggage.
You've got to design that into the system starting right here at
the beginning of your design efforts. That requires funds pushed
up front. Next time you need an argument for why you feel intui-
tively you must do this, this is the quantitative argument for
why you must do that. This is the essence of Actions 9 and 31.
Incidentally, I got a recent data point for you from the steering
group, which General Pellegrini referred to. That's the steering
group headed by Bill Long on the implementation of the Acquisi-
tion Improvement Program. One of the things that is getting the
attention of the steering group is modeling of A0, and tying it
all together; tying together the people into A0; tying together
the spares; tying the whole logistics package together. So, I
think we're going to see a significant amount of increased empha-
sis. The Army is already involved in that, of course. The Air
Force is doing some work, as well as the Navy. So significant
increased emphasis in that I think you can expect. That's 9 and
31.

The next one, of course, we recognize right up front. Most
of that is going to be done by the contractor. We want to design
supportability, design reliability into the system, and we want to
incentivize the contractor to provide us systems which are, in

fact, designed to be supportable, designed with readiness in mind. So we take advantage of all the tools that are available to us, starting with the source selection process, moving on into the incentives and award fees. Incidentally, one of the themes that is running through the Acquisition Improvement Program -- use of incentives, use of award fee contracts, and use of even the greatest incentive contract of all, the firm fixed price contract. Consider guarantees and warranties if they make sense, the case of the F-16 program, for example. You got nine items that have guarantees on them and a couple of the avionics boxes have mean time between failure warranties on them.

So, use all the tools that are available. To incentivize, you design up front of systems which are basically supportable.

Standard systems -- here's an area where we're not doing very well. The emphasis here is largely in the area of avionics and also test equipment. The idea of this particular initiative is to put more effort into the RDT&E so that these things will end up on the shelf and then can be selected out for a weapon system at a later point in time.

Just one example of a success story that we have in the avionics area. The Services finally got together and decided to buy a central air data computer. Estimated savings, $140 million. But we're not doing so well in other areas and really not making as much progress here as we might.

The last chart here deals with the disconnects that often exist in our system and what we're trying to do about that. Notice that when you start figuring out who all the people are that make decisions with respect to a weapons system, the Program Manager is involved in only very few of those. Let's take the training environment for a minute. Take the Air Force, the Air Training Command. If they make decisions with respect to the amount of training that they're going to give to a person or to the people that are going to support a system, that impacts the design, and the complexity of the design is going to impact the level of training that is required of Air Training Command. The real life situation is that the decisions get made in one environment which are not reflected into the other environment -- you get disconnects. You end up with an unsupportable system.

Action -- part of the Department of Defense and the Services, and this is underway. Design systems which give more feedback back to the Program Manager as to what these other decisions are. That's going on and that's working out.

Well, there are 32 actions. I'm not going to run over the rest of them, but I'd just like to point out from a status point of view a couple of things which I think are important for you to understand. First off, pre-planned product improvement -- people

are getting the word. It is going on. Multi-year procurement --
you have seen the lists in the papers and so forth, and in fact,
people are putting the money up front to cover the cancellation
ceiling, and the savings to be got by multi-year procurement are
indeed significant.

Capital investment -- well, let's look at a couple of things.
Vincent . . . Act repealed. Manufacturing technology program --
going strong. The past five years, manufacturing technology in-
vestment was 3/4s of a billion dollars. Projected for the next
five years, $1.8 billion. Significant impact on capital invest-
ment. The Tech Mod Program -- the F-16 Tech Mod Program. You're
familiar with that, so some good news there. Economic production
rates -- we've added a couple of billion dollars to FY 83 to bring
things up to economic production rates, and once again, net savings
result from that. Number 10 down here -- reduce administrative
costs and time -- you recall the Authorization Act of last year;
we raised the thresholds for things like contractor costing data
for the D&F -- that's an internal and Services kind of thing; we
also doubled the reprogramming thresholds for RDT&E and also for
production procurement. That was the Appropriation Act.

So some things are going on there, some successes. The Joint
Logistics Commander has a two-star level implementation group.
They reported back to the steering group earlier this week. One of
the reports back from that JLC working group, headed by General
Chubb, Air Force, is that they can validate auditable savings of
the order of $11.2 billion so far because of the actions that have
been taken in the Acquisition Improvement Program. That's signifi-
cant. Significant progress has been made.

In the way of a status report, let me just give you a couple of
other themes that are running through the Acquisition Improvement
Program and just put them in the back of your mind. P^{3}I -- pre-
planned product improvement. Look for opportunities for it because
it allows you to put lower technology on the main line of the pro-
gram and to bring the alternate technology along on a separate line
where it has less chance of causing the program to falter in cost
over-run. Tailoring -- tailoring of the acquisition process is
another theme running through the acquisition improvement program
through here. If you don't need a . . . , don't put one in, for
example. Concurrency -- you know how concurrency goes. It rides
waves up and down and up and down. Now, we are in a period of
emphasis on ascending on increasing concurrency. We'll talk about
the reason in a minute. Incentives -- that's another theme that's
running through this. You'll see it picking up many places. Let's
get the behavior that we want to occur by applying appropriate
incentives. Finally, the last word that I would comment on is
innovation. People are out there still looking for innovative ways
of getting these things accomplished. Multi-year procurement is an
absolute zoo because the word is out, it doesn't make any difference
what the law says, if you've got an innovative strategy and a good
idea, we're going to take a look at it and in fact, even though the

DAR and the DOD directives prohibit some ways of doing multi-year procurement, we're still making it happen by exceptions. So use innovation.

The next chart is a scorecard. We've done some things. We've got some things in progress. A lot of the things that we wanted to get through Congress still haven't got there, for example. I think the interesting column is this one in the middle. We have a lot of things that are in our court. The things like -- multi-year procurement is never going to happen on my program unless I take the initiative to start the ball rolling. P^3I will never happen on my program unless I take the initiative. The Dean of the School of Acquisition Education, Captain Pierce, came to staff meeting in the early spring time frame and said, "I heard an interesting sermon on Sunday. It was on miracles. The thing about a miracle is it has two parts -- the first is faith and the second is initiative." I haven't had a chance to figure out the theology of that in the last six months, but I'm sure that must be good, too. But you know, initiative is where it's at. That would be, perhaps, the bottom line message that I would leave for you. It's going to take the person with courage, the person with guts, the person with initiative to make real things happen with respect to the Acquisition Improvement Program.

This gives me a chance to change gears for just a minute, because one of the things we've been doing -- and I refer you to a very useful report, taking a look at what we call an unconstrained look at the likely world of 1990 to 2000. I copied those words out of a report by Air Force Logistics Command called, "Destination 1999." Take a look at it if you get a chance, because what is does is look at demographics. It looks at geopolitical arrangements. It looks at military expectations. And it gives some excellent projections, and they're well-reasoned, into what the most likely world is going to be out there and what you ought to be thinking in terms of technology, what you ought to be thinking about in terms of strategy. I commend it to you. What we're doing is taking a look at some of the spin-off from that and what that might mean in terms of acquisition management. I've got a few ideas I'd like to present to you.

First, the environment, as far as manpower and personnel is concerned. Already this has been discussed today. But for summary purposes, the work force is aging. The decline in numbers in the 18 to 24 year group by 1990 will be of the order of 4 million people. The work force will be of the order of 20 percent retired. There will be no unemployment of the kind we have now. What does that mean defined in the quality of people that are going to be available to manage our systems, to repair our systems? Now, let's compare and contrast that against the technological environment. The half life of technology is of the order of 10 years. In the case of computer technology, it's probably 2 to 3 to 4 years. If it takes 15 years to build a weapon system -- you remember the quote

that was made a little bit earlier, which I think is one of my favorite ones -- if it takes 15 years to build a weapon system, we've already exceeded the half life of the technology we're trying to get into it. Indeed, there are some people that even suggest that the B-1 was obsolete when it was cancelled by Jimmy Carter. So the half life of technology is short, and that is the reason why we're pushing very hard to shorten the acquisition cycle. That's why concurrency is on the the ascendancy now.

Computational speed and cost -- it is estimated by 1990, we'll have of the order of a megabyte of storage on one chip. Artificial intelligence clearly is going to make major impact over the next few years.

The implications as far as training is concerned -- we've already talked about the decreased availability of capable individuals. One of the things that's going to force, it would appear, is a heavier reliance on automated equipment. That's an interesting one, too, because that's more complicated to maintain itself. There are going to have to be some very interesting strategies worked out in terms of how do we cope with that.

The implications as far as research and development -- we've already talked about Pre-Planned Product Improvement. Built-in test equipment for the reason I just mentioned. Alternate materials -- that's another topic and it deals with the strategic critical materials business.

In terms of this bullet right here, we're looking at equipment that is going to have to sustain itself in the field for longer periods of time and with less requirement for return for repair and so forth. That has to do with the fragile nature of the LOCs and other factors. And if you take a look at the need for self-sustaining equipment or equipment that requires very little support, then you start thinking in terms of graceful degradation and fault tolerant kinds of things, particularly in computer circuits and not just for satellites, but indeed for training systems, for test systems, and so on. And then finally, energy efficient systems, as well, for obvious reasons.

Well, in conclusion, we've made some real progress. It's quite clear that particularly for the past couple of years when we've had budget growths, it's been relatively easy to make some progress and I've noted a few of those items already. It would appear that the consensus that I talked about at the beginning of the presentation is degrading. You take a look at the 15 November Business Week. You look at the Harris poll reported there and discover that the consensus to rebuild the military might is, in fact, declining. The real challenges lie ahead. In the longest period of sustained growth, real growth, of the DOD budget over the past 30 years, it's been three years and I remind you that we had real growth in FY 80, FY 81, and FY 82. We may break historic precedent and have real growth yet again in FY 83.

There's a real chance that FY 84 is going to be a disaster. That's what Peter was talking about. That's the time when the challenge is going to really be for you and for me, and I put it to you and I hope you're the tigers capable of meeting that challenge.

BGEN Pellegrini

We're ready for your questions. I guess before I throw it open to the floor, I would like to attempt to summarize . . . program management from my view and from the school's view and I believe the views you've heard here, we take very seriously. There is increased emphasis at all levels in DOD to take program management very seriously. Having been a PM, I can assure you that when I'm given an acquisition strategy and I'm given certain resources, I'm going to resist like hell the change unless someone gives me more resources. The message there, I would suggest, is that each of us needs to make sure we get our inputs into that acquisition strategy so when you hand it off to a PM, he, in fact, then executes according to that strategy. Tied into that very closely is resist change and don't always come up with a new idea which means a change to the contract, which means . . . cost. Do you have any questions?

Question -- Cannot be heard

BGEN Pellegrini

Let me just give you a couple of views on that. In regard to the number of briefings PMs have to make before they get a major decision, I've just been told on the Army Staff, General Meyers requires any of his Staff officers that call a PM up to Washington to report to him, the Chief of Staff, why they called the PM up there. Now, that's a step in the right direction. Too often you go to Washington to the E Ring to answer questions on your program because someone wants to take away resources or add requirements with no resource, and they're not . . . a clear decision . . . I sense it in the Navy in talking to Admiral Williams and others that they are trying to delegate more of the decision-making down at lower levels. One of the initiatives -- and Dana did not mention it specifically -- was control decentralization. To move decisions from the OSD level down to the Secretary down to the field. Is it working? Ben Pellegrini's view -- not really. In talking to some of the PMs and the people out in the field, they still see the same number of . . . and the same number of requirements. Will it work? I think it will work if we start getting people, again at the senior levels, to really take note of what the impact is every time you cause a PM or someone in the PM shop to come up and give a briefing or to respond to some requirement that prevents him from executing . . . and managing the program. There are some moves to reduce some of the requirements. As Dana mentioned and I mentioned, we are working with Bill Long and his steering group to try to reduce some of the paper requirements. We still need to do more.

Mr. McAleer

I'd like to just comment that one of the high interest efforts afoot in the last month is to take a look at procedural items, data requirements lists. There's a lot of interest in, for once perhaps, really taking a slice of that and seeing if we can significantly create the environment in which those are significantly reduced.

Question -- Cannot be heard

Colonel Brabson

There is definitely an issue here with communication. What happened, in fact, with the case of the Navy was, they said, "By golly, we will cut back on briefings," and the first time they tried that, they had Staff officers standing up in meetings and saying, "We never heard that story." His boss would turn and ask him what he thought of that and he would say, "Never heard of it." That's the other side of the coin.

BGEN Pellegrini

He does raise a very interesting point, and that's sort of along the themes that Tony Battista usually tells us in the DOD. "Tell it like it is and don't lie to us. Give us advance notice." Well, we in government and you in industry have to be together, too. We've got to have a non-adversarial relationship. We've got to both be together so when you have a situation that's going to have a cost impact or a schedule impact, don't wait until the eleventh hour to tell us, and we, in turn, have to run around up to our higher headquarters only to find out that we then get charged with mismanagement or not sharing that walnut in advance.

Question

I'd like to ask probably the same question in a different way. Apparently we have an ideal for program management, what we consider to be certain tenets, at least, that we present to all the students, whatever Service they're from. Do we have any feel for the different Services' way of implementing these ideals and what it does to the system? I'm thinking, for example, we were talking a moment ago about bringing the Program Manager to Washington. I gather from the Army standpoint that means bringing him from some other state, but in most cases in the Navy, the Program Manager is right there in Washington in NAVMAT or one of the Systems Commands. Is the way the Air Force and the Navy and the Marines and the Air Force, the three major Services, do business? Does that impact on what we consider to be the ideal for program management?

BGEN Pellegrini

That's difficult for me to answer and let me tell you why. I am in the business of educating people and what you're really asking me is how well are the Services implementing some of the Carlucci initiatives, decentralization. Let me just say that -- and Dana did not mention this -- over a year ago, the College was asked to go out to the field and brief all the Services on the Carlucci initiatives. We briefed some 10,000 or more people and we told them what the initiatives are all about and we also got feedback. One thing we got from the field was controlled decentralization is not working. I brought that message to my boss and it was almost like the days of the Pharaoh, when you bring the bad news, shoot the messenger. But he was quick to point out, it's controlled decentralization and the implication there is that if you're a PM, if you don't know, you should find out at what level will decisions be made in your program and by whom. And you need to get that understanding with your boss. That's the contract, as far as I'm concerned. If I'm a PM, whether I wear a blue suit or a green suit, I ought to know at what level will decisions be made in my program and by whom. And that's my environment. Now, we also continue to get feedback from our students. Every student that comes from the school, we put together a questionnaire and some of the information we got there is that everyone says the initiatives are great -- however, the senior management is not fully endorsing it. When I gave that report to one of my bosses, specifically Admiral Williams, he wanted me to quantify and say, "What do you mean, senior? I'm senior and I'm certainly decentralizing," and I had to do a little soft shoe and hem and haw. But again, from the view from the field, people are not seeing many changes. I'm sure you realize, with the initiatives we've merged together the PPBS process with the DSARC process, and the justification for new starts. When the Secretary of Defense signs off on that, that ties in that the Services better put the resources in for the TOA and the FYDP and so on. And that also suggests that you have a contract. I didn't really answer your question because I don't feel I have enough first-hand information to know how well the Services are doing. I maintain that if you're a PM and you understand the environment, if you don't understand the environment you live in, understand it. Get to know that environment. Get the contract. And if your boss takes away one resource, say new contract. If you take away people or you take away dollars or you add requirements and don't give me new resources, that's a new contract, that's a new acquisition strategy.

Mr. Zimmerman

Can I second that point? Where I started out in a project office, my boss had a very clear sense that you can play with the schedule, you can play with the dollars, you can play with the technical requirements, but if you're going to change one of them, other things have got to change as well. I think too often,

"can do" spirit -- you know, "Yes, sir, Admiral, we can bring it in. You've cut our budget 20 percent, by someone we're going to bring it in, and we're going to bring it in on time." Too often, a desire to please one's boss gets in the way of doing just what General Pellegrini said project managers ought to do. Also, back to the first question, 57 briefings sounds like an awful lot, but that process of briefing, of talking, of arguing, conjoling, persuading, negotiating, bargaining that project managers do, that's the essence of their job. And it's not just within the Navy or within the Services, but it's dealing with OSD, it's dealing with the Hill, dealing with industry, the press, interest groups of all kinds. What you have to look out for and what a lot of project managers that I've seen don't do, is make sure that that doesn't get in the way of your people doing the job. Some of the very good project managers that I've seen understand that. They're sometimes accused by their colleagues of being "political," whatever that means. Well, it's a political world we live in. What you want to do is protect your organization. You want to be the buffer. You go out there and get those resources and get those contracts written, and don't pulse your organization every time someone from Capitol Hill calls. Bad project managers that I've seen, you know -- the General gets a call and the organization goes to general quarters. Everybody tears their hair out and starts running around saying, "Oh, my God -- the General got a call and he has to go see the Senator, or the Assistant Secretary for this or the Assistant Secretary for that. Everybody drop what you're doing and let's get a new briefing," -- and they spend days massaging data and things like that. That's not the way you run a project office. The kind of job that I had when I started out as a GS-7 in government was to work for an Admiral and I did a lot of the running around and getting the data. He didn't want me to go and mess around with the engineers; he didn't want me to go down to the Technical Division and shake people up. "Oh, Zimmerman, you'll learn enough so we can make do and we'll fuzz it, we'll wave our hands a little bit and maybe they'll go away and leave us alone." Sometimes they would and sometimes they wouldn't. But it's what the project manager does in that process that's going to make a difference. I don't think we're going to fundamentally change the process dramatically, neither us nor anybody else that is likely to be here.

Question

I have two unrelated questions, General. My first question is almost answered, I think. I've met a lot of your graduates. I've worked with several of them and they're really fine people. I don't know whether that's a function of the selection process or of being graduates of the College. Nonetheless, you have a fine data base of people out there who have gained a lot of experience in program management. How much do you formally use that data base to (a) shape the curriculum, and (b) to get feedback back to the folks who you really work for? Then I do have another question.

BGEN Pellegrini

It sounds like you attended my last policy guidance council meeting. That was my first one with my bosses and short answer is we have not been doing a very good job -- we, the College -- in keeping the student demographics, to find out where the students come from; after the students leave, how well are they used, how well do they perform. So I have charged my Dean of Research down here and internally we're going to start a research on student demographics to answer the questions you're raising, and then one thing I'm going to do with that, I'm going to look at my curriculum. I have 400 hours in my program manager's course and I break it up into different percents of things. I've got to ask myself if I have the right mix; do I have enough percent of my hours on a platform dedicated to ILS, as opposed to System X, as opposed to something else. Until I start getting some of that feedback, all I can go on is general comments that I hear, that generally, students going through the PMC think it's one of the better courses they've had and they really feel value has been added. We have to do more on that. Another thing I see out of that is -- I mentioned to the Joint Logistics Commanders that I felt a throughput of 400 students a year through PMC was far too few. I am the only school -- and I'm not trying to beat my breast -- but I'm the only school in the Department of Defense that teaches acquisition management to program managers. There are 10 other Service schools, War College level and intermediate Service level, that teach all the other things that we do in the military. When you look at the proportion of the Defense budget that is in our area, intuitively you'd have to say we aren't educating enough of the people. So I'm going to try to use that to support that argument.

Question

My second question, Sir, is what do you see as the proper insertion point for an individual to go to this school, and I guess you have to couch your answer in terms of military, civil service, and industry.

BGEN Pellegrini

Good question. You saw on the profile my present PMC student, 14 years service, 38 years old, a Master's, and six years acquisition experience. That's a combination of Army, Air Force, Navy, and civilian, both uniform and civilian. When you really start looking at the details, the Air Force tends to send younger officers, typically 10 to 12 years of service experience; they also have more acquisition experience. On the other end of the spectrum, the Navy tends to send people with fewer years of acquisition experience and fewer people. I think DSMC and the Program Managers Course should specifically target in at the senior Captain, Major level, and perhaps Major promotable to Lieutenant Colonel,

and comparable civilians, and it should clearly focus in on people that the Services have earmarked that will be managers in the program acquisition business. In my best-of-all world, I would hope that all Services in the near future, be it 85 or 86 or whatever, would say as a matter of policy, if you're going to be a program manager in my Service, you will have gone through the Program Manager's Course. Today that's not true. I was a Program Manager. I had a program in 1977. I did not go to PMC. I was a Colonel at the time. The timing was such that I had to take over the project and I came back later and took the Executive Refresher course. I learned a lot of things that, had I gone through PMC, I think I would have been much farther down the learning curve as far as managing a project. I should also hasten to say, and those that wear the deep blue, I recognize the Navy's got different problems, different priorities, and just to give you a mindset, I've got 191 students right now in my PMC; 70 Army, 70 Air Force, 30 Navy, and the rest are from government agencies and industry. The Navy has a difficult time breaking loose an officer for 20 weeks, and that's one of the reasons I'm forming these three three-week package courses.

Well, let me thank you for being part of our session here, and let me also thank the members on my panel. We appreciate it.

LUNCHEON SESSION

Mr. Paul Watson

For those of you who have short memories or got some bad ice cubes last night, as was pointed out to me by some of my table mates, my name is still Paul Watson. I'm not going to touch Colonel Castellana's reference to me yesterday with a 10-foot pole.

As we are all aware, having participated in these magnifici-cent goings-on around here up to this point, this type of conference requires the dedication of a large number of people. As we look at the program and review the individuals who worked on the separate committees -- the committees like the Conference Committee, the Liaison Committee, the Program Committee, and so forth -- then we review the individuals who appear as Plen-ary speakers, as panel chairmen, panel moderators, and panel-ists, time alone prohibits our giving proper recognition to each person, Service, or company who has contributed to greatly to the success of this conference.

However, there are some things that I think are appropriate to say. As I said yesterday in the opening remarks, the National Security Industrial Association is organized into standing committees and it seems appropriate to discuss that the organi-zational element within the committee structure that houses the activities of this conference is the Personnel and Training Group, and within that group, the Trainers and Simulators Sub-committee. I'd like to identify and recognize first the Chair-man of the Personnel and Training Group, Mr. Wolfe Hebenstreit of the Boeing Company. Then I think it would be appropriate to recognize the Chairman of the Simulators and Trainers Subcom-mittee, Mr. Robert W. Layne of the Hughes Aircraft Company.

Now I'd like to issue citations. There are three people who need to be recognized. They are Mr. Thomas W. McNaney and Lieutenant Colonel R. E. Fairfield, the Co-Chairmen of the In-terservice Steering Committee, and Dr. James A. Gardner, the Conference Chairman.

We all know that there's the officially published organiza-tion and then there's the unpublished, underground, grapevine organization that holds forth. In this hidden organization, it comes to light that early on, Jimmy Gardner got the name of being the great organizer, as an organizational title. At one of the committee meetings that he had called, he put out the announcement of a need for a committee conference meeting and on that -- now, this is a very early one. It had the confer-ence committee meeting and the date and the time, it had an

agenda with particular people who were responsible for reporting on their activities up to that point in time, but no place on the entire three sheets of paper was the location noted -- Salt Lake City, Orlando -- the great organizer. Of course, then, Tom McNaney has become known as the great communicator over this period of time. You see him walking around and he has this nice handy-talky, walking around with it. It turns out that the first few days before we convened the conference, the committee people were walking around with these little beepers on their belts. But they didn't take those up before they issued the handy-talkies and 1 noticed Tom periodically would get confused. He'd get a call on his handy-talky and he'd run to the nearest phone to answer his beeper, or his beeper would ring and he'd try to get someone on his handy-talky. But we solved that prob- lem -- we took his beeper away from him.

Of course, Skeets - it took me a while to figure out what he was doing. Being an intrepid Marine, it's kind of hard to figure out what their direction is at any given point in time, but I finally figured that out yesterday morning in a side con- versation over in one of the areas over here. I decided that Skeets had to be the quality assurance guy for the whole confer- ence. The reason is that as we stood there talking, he said, "Boy, I've been looking all over this conference for problems. I can't find a problem anyplace." His brow furrowed and he said, "I'm really getting scared now."

Seriously, without any further discussion, let me read some citations and pass them to these folks.

First, to Thomas McNaney -- in appreciation for outstand- ing leadership as co-chairman of the Interservice Steering Com- mittee for the Fourth Interservice/Industry Training Equipment Conference during the period November 1981 to November 1982, let me present this to you.

Now, to Lieutenant Colonel Fairfield, USMC -- in appreci- ation for outstanding leadership as co-chairman of the Inter- service Steering Committee for the Fourth Interservice/Industry Training Equipment Conference during the period November 1981 to November 1982, I present you this.

Dr. James A. Gardner -- with appreciation and recognition of outstanding leadership while serving as Conference Chairman of the Fourth Interservice/Industry Training Equipment Confer- ence during the period November 1981 to November 1982, I pre- sent this.

Colonel M. D. Calnan, CAF

Ladies and gentlemen, I would just like to indicate the appreciation of the Canadians who have been here, also to show

that you did not destroy me last night. I can still out-sing
anyone here. Thank you very much for having, recognizing, and
including the Canadians in the last two conferences, and as a
matter of fact, including us in the User Committee and so on.
It was well appreciated and on behalf of Admiral Wood, who re-
grettably cannot be here today, I would like to present to Mr.
Watson a Canadian Forces plaque. Thank you very much.

Mr. Watson

Thank you very much.

Now, without any great amount of introduction, let me pre-
sent Captain McHugh to introduce our luncheon speaker.

Captain McHugh

It is my pleasure today to have an opportunity to introduce
the third in what I think is a very fine series of luncheon
speakers and maybe make a couple of comments regarding the con-
ference. I think all of us have certain indicators we depend
on in life and one of the ones I depend on is if you don't have
football, there's no Thanksgiving. I think you always get these
things reinforced, like I went into a store the other day and I
noticed they had all the Christmas decorations out so I figured
Thanksgiving was cancelled and we'd never see football. But
thank God, they've just resolved their strike and we're on the
right track again.

Some of the other indicators you get in life is how suc-
cessful a conference can be based on the speakers and how well
it's attended, and this certainly has turned out to be one of
the finest that I've seen since I've been involved in this.
Major General Day led off the first day talking about the lead-
ing edge, the real Marine, the foot soldier. Admiral Williams
followed very shortly thereafter by reinforcing the leading
edge. Following on from that, he also went into the themes
of this conference, which were technology, management, and
above all, the user. We've highlighted throughout the confer-
ence the user. Well, the Navy has a leading edge also. The
leading edge of the United States Navy is our battle group and
the very heart of our battle group is the large aircraft car-
rier with its complement of extremely sophisticated aircraft.
They do an absolutely marvelous job. It's a beautiful fighting
machine and it's really a marvel to most people who see it. The
key that makes those carriers go around is the training, the
people, the technology, and sophistication. Today you've got
a very special person. In the United States Navy, the man in
charge of all our aircraft carriers for the Atlantic Fleet,
the one that brings the aircraft, ships together, makes sure
they're operationally ready, and deploys them is Vice Admiral
Kilcline. Very briefly, Vice Admiral Kilcline is a graduate of

MIT and the United States Naval Academy. He's been through the
Test Pilot's School at Patuxent River. He's no stranger to
central Florida; he spent some time right up here in Sanford.
He's been involved in the early days of the RVH community, bring-
ing reconnaissance into the Navy. He's served as Executive Offi-
cer of the TICONDEROGA. He's been a Program Manager in the Naval
Air Systems Command. He's been the Director of the Office of
Liaison with the House of Representatives. He's been Commanding
Officer of the Naval Air Station, Patuxent River; Commanding
Officer of the Naval Base in Subic Bay; and been the Chief of
Legislative Affairs for the entire United States Navy. Most re-
cently, he became the Commander of Naval Air Forces, Atlantic
Fleet as of July of 1981.

This man knows material, he knows people, he's experienced
with our very confused management systems and political systems,
and certainly probably one of the most qualified people to end
this conference and address you as interested supporters of the
United States Navy and, of course, the Department of Defense.
Vice Admiral Kilcline.

Vice Admiral T. J. Kilcline

Thank you, Jack. Ladies and gentlemen, I realize that this
lunch period is probably taking a little bit more time than
you'd planned. I'll try to make my reports to you a little
short. I've got about 10 pounds I want to put in a 2-pound
bag, though, and it's going to be tough. There are a lot of
things I want to say. I started going through my notes this
morning and everything that was there I could double or triple.

But let me first of all indicate that I'm impressed by what
I see here and delighted. This is a significant assembly of
industry and military, a very special challenge. All of you
here have a real opportunity to roll up your sleeves, as a lot
of you have physically done right now, and get down to some real
issues, the kind of things that we need to face in the training
of our military force. You've run the gamut here in 2-1/2 days,
but I'm delighted to see that you not only take a look at the
costs of the training methods and procedures and everything
else, but you also take a look at the user. That's where I
come from.

When I think of the user, I think of that young man fill-
ing a hundred different roles out there in the Fleet, that guy
who is a technician on the weapons system, who has to make his
. . . work day in and day out, or his SPY-1 or whatever it is.
That young officer in CIC who has got to know his rules; that
tactical action officer who has to know electronic warfare,
C^3CM, the ROE, all those things. That young EW operator, that
young man at a scope who has to work the outer air battle re-
gardless if he's on a cruiser or a carrier or up in an E-2C,

or the young naval aviator who has to make that airplane work,
whether he's a pilot or an NFO. They've got a tactical mission
to do and it's a tough one. The environment they live in today
is not an easy one. We face a greater challenge as a nation
today than I think we've ever faced. I'm not exaggerating or
saying it for rhetorical purposes. It's intense and real and
we're caught up in the middle of great advances in technology
at the same time.

All this affects how we think, how we plan, how we live.
As operators and planners, how do we face this challenge in
this sophisticated world we are forced to live in? We don't
prepare, necessarily, just by building new carriers or F-15s
or M-1 tanks. We've got to be able to train these young people
and train them effectively, practically, and quickly. We ask
an awful lot of these guys and gals today and that's why we
need to be efficient and innovative. We've got to find a
better way and that's why we're all here today.

I'm kind of excited about your program. We need this
type of interchange if we're going to stay on the course
toward the maintenance of our readiness, our credibility as a
nation because without that you're not going to have the abili-
ty to deter and to maintain stability in this world of ours.

I come to you today as a guy who is responsible for a lot
of people at sea. I've got a lot of different kind of assets
to help support, but the key one, the one that Jack mentioned,
I'm responsible for eight of the mightiest weapon systems that
we've ever devised. Our carriers compromise the very heart of
our striking ability. They are really technological marvels
and they're one hell of a training challenge. They are so
important and they're such an essential part of what I live
with day in and day out, that I think I need to expand on that
just a little bit, some of the concerns.

You heard a little bit from Senator Glenn last night and
I'll try to reinforce some of the things he said. During my
39-plus years in the Navy, most of which have been directly
in naval aviation, I participated in this debate that surrounds
the aircraft carrier over and over and over again. We've heard
them called lots of funny names -- Dinosaurs, Sitting Ducks --
and I'm going to talk a little bit about the carrier for a
few minutes. But first of all, I'd like to put that discussion
in perspective. We're really not discussing the aircraft car-
rier. We're discussing air power at sea and that's the bottom
line. In all the arguments I've heard, and I was delighted to
see John talk about it last night -- he said some of the exact
same words -- but I believe in that. We've got to focus on
that -- the carrier comes along -- because that's our platform.
But we have to have air power. How long has it been since

somebody won a war that didn't have control of the air? World
War I, before air power became a factor -- you can't, I don't
care if it's at land or at sea, you can't operate unless you con-
trol the air. So we have to keep that part of the issue fore-
most.

It is our platform. It is our platform because that's the
one we have today. As an operator, it doesn't make any differ-
ence where the air power really comes from. It can come from
land, from space, from under the water. But we have a special
problem today. Our responsibilities throughout the world are
so great and so vast because the oceans of this world are great
and vast. There are so many areas that we have to go where our
interests are great that we don't have major shore bases, major
air fields in all these locations. We have to have the flexi-
bility because when I need something at sea, I need it now. I
need it where the requirement is. We can't wait for diplomatic
clearances to overfly someone's country, to land in somebody
else's air field. That power has got to be responsive to our
needs when and where. We do have carriers today operating all
over the world. It's kind of exciting, but it's a hell of a
challenge.

Let's talk a little bit about the carrier itself. So,
you need it, but it costs a lot of money. Boy, it sure is vul-
nerable. How can it ever survive? Let me answer some of those
questions. They're serious questions and they're deserving of
serious discussion.

Unfortunately, not many people have time to sit and fight
these problems out in the public forum. You see them digested
in 15 seconds on the evening news or a few paragraphs in an
article in the press. It's rare that you see a whole Op-Ed
piece that would be dedicated to this one kind of subject. It's
been over-simplified too often and I can't correct that in a
few minutes here. But I just want to make sure that you under-
stand from where I stand, where I have to worry about whether
or not they're vulnerable or whether they're survivable, that it
isn't that easy to find a carrier or a carrier battle group at
sea. We're not just out there sitting and waiting to be found.
We've got a lot of good operation tactics, we have a lot of
technology that helps us. We know what they're doing -- there's
a lot of ways to hide. So just that we're there doesn't mean
that we're going to be found. No more than just if we're found
that we're going to be sunk. Vulnerability -- everybody is vul-
nerable. It's a matter of degree. How long can you wait, how
long can you hold off? We can move a carrier battle group 600
miles in a day. We can do a lot of things electronically. We
can do a lot of things with the intelligence we have. We can
also help ourselves survive if we are found. The outer air
battle I mentioned a minute ago -- the outer air battle is way
out there today. The E-2C, the F-14 combination is impressive

and getting better all the time. We're learning how to use all
of our systems. Systems against the submarine threat, whether
you have to use the ASW ships, some of them with their tails,
the S-3 aircraft is coming of age this last year in particular.
We're learning how to put all of our systems together.

Our shooters, our cruisers and destroyers with missiles,
close-in weapon systems -- no matter what it is, the whole sys-
tem works together in a synergistic effect.

Then, how do we build the ships? We build them tough. The
carrier is built, first of all, to handle the airplanes that
we have aboard today. The size is basically dictated by the
catapults and arresting gear. The second thing is size because
we want it to survive.

We've talked about air power at sea many times, but if you're
going to survive at sea, you've got to have your carriers. The
carrier is the only obvious equipment advantage that we really
have over the Soviets. When you start talking about forces,
the Soviets understand that. They've done things -- . . .
class cruiser, I call it; air capable ship. Very good ASW plat-
form. The fourth Kiev is on the ways. Another air capable ship,
a damn good cruiser. It carrier aircraft equivalent to Harriers
plus . . . Our intelligence folks have told us they are now
building a very large nuclear powered ship. From all indica-
tions, it's a carrier, somewhere between the MIDWAY and the
FORRESTAL size. Why not? If they really want to be dominant
at sea where they want to be dominant, they're going to have to
have air power, and if they're going to be able to do this,
they're going to need a carrier. If they're going to be able
to extend their influence as dramatically and effectively as
possible, we shouldn't be surprised. But in meeting this growing
threat -- not just the carrier but the whole structure -- again,
you've heard so often, the great military build-up of the Rus-
sians, we've got to have at least 15 battle groups at sea so we
can have the essential capability in our global and regional
conflicts.

The next item is cost. How much does it cost to build a
carrier? A hell of a lot. Is it worth it? How many people
here remember the big fight when the ENTERPRISE was first pro-
posed in 1958? I remember it. The price tag we talked about
was $451 million. In those days, that was one hell of a lot of
money. That ship is about 24 years old now and it will last at
least 20 more years. Amortize that, that comes to about $10
million a year. Sounds pretty good for a truly significant
system. Our systems today -- $3.4 billion each. What are we
going to say 30 years or 40 years from now? All the times we
will have used it. There are a lot of different ways we can talk
about cost. Let's talk about why build a big carrier -- why not
a small carrier? You've all seen the arguments from some of our

friends, especially some of John Glenn's friends in the Senate.
. . . . If it's still going to have some basic capabili-
ties that are the same, a ship half the size will cost somewhere
around 70 percent as much, will carry two-thirds as many air-
craft, and the capability will be even less than a third because
you will not have an organized wing aboard. You'll have to have
several ships together to get that. You won't be able to carry
the same proportion of stores, weapons, fuel. You won't have
the same kind of a platform for the Commander at sea. You won't
be able to stand up to the tough weather.

Our big ships today are something impressive. We've gone
through this study so often and we haven't done it all the time.
Sometimes the guys wearing the dark blue suits do the studies.
Sometimes it was civilians who work for the Navy who did the
studies. Sometimes those studies were done under the aegis of
the Congress. Sometimes under academic groups. Some of our
very fine think tanks have put some packages together on this.
There are some people who feel that it might be better to build
a small ship, but they are definitely in the minority and they
don't include many people who have ever had to go to sea.

I'm confident that our decision is the right one and our
thinking, people who support us have continued to support us in
that direction. Is it going to impact on our growing Navy? No,
not really. In the last 20 years, we've built five carriers
and that represents 3-1/2 percent of the funding for shipbuild-
ing and 3-1/2 percent investment in this part of our system is
really not that significant. We're going to put a lot of money
in this year's budget, I think, to build carriers. We're not
going to build these battle groups in one year. What it is
is an industrial business initiative and a very good one, but
by giving industry the assurance that they're going to be able
to have stability for a number of years -- we're building the
TEDDY ROOSEVELT right now; we build two more following that.
That kind of assurance to major industry encourages them and
allows them to do some long-range planning which results in
hundreds of millions of dollars of savings and years of deliv-
ery time. Things that are important to all of us.

Let me put this thing to bed. You guys are ready to go
do some other things. For 2-1/2 days now you've been sitting
here talking about all the different aspects of improving our
training, helping us with our systems, reliability, maintaina-
bility, supportability, affordability. All of those things
are very practical and you should. But let me put a pitch in
for my system. We need our carrier battle groups and training
them is not a simple thing. These are truly multi-mission
systems. There is no question about the fantastic three-
dimensional threat they face and whether you're talking about
training the bombadier and the pilot of an A-6, or the fighter
pilot and the . . . in an F-14, or you're talking about that

tactical action officer in CIC, no matter where it is, these guys are part of a very complex system and they have to be trained in how they're going to make their decisions. Flying the air-planes is part of it. Some of the day-to-day problems of handling a piece of radar equipment on a ship is part of it. But it's a very sophisticated world out there these days and we need to learn how to train our young men and women, the young men who have to take it to sea, the young men and women who support it ashore. I look to you to help solve that chal-lenge to all of us.

Thank you for the opportunity today. Thank you for the invitation.

PLENARY SESSION

CONTRACTOR OPERATION AND
MAINTENANCE OF SIMULATORS PANEL

Captain M. M. Scott

There are no dinner rules for the audience. If you're uncom-
fortable, please take your coats off. If you've been sitting
through the past luncheon and are tired of that, then continue
standing.

Good afternoon, ladies and gentlemen. I'm Captain Scotty
Scott from the Naval Air Systems Command in Washington, Program
Manager for Weapons Training and Training Equipment, also known
as AIR 413.

The discussion today is on a subject that I think is dear to
all of us, commonly referred to as the COMS Program -- the Con-
tractor Operation and Maintenance of Simulators. I think today's
discussion will be enhancing, beneficial, and interesting, and
hopefully you will stay awake, because you elected to remain here
on a Thursday afternoon, the last major panel discussion, and
that is appreciated by all of us.

In the next 20 minutes, I'll give you an overview of the COMS
Program. This is really a new industry and is a large-scale
effort. It is designed to improve the readiness and availability
of aviation simulators that has been deserved by the Fleet and
the user commands for so long. As you can see by this slide, I
will give you a quick overview of the why, what, how, and when
of this program. Following my quick overview, each panel member
will take a maximum of 3 minutes for their comments, at which
time, then, we will get into a panel discussion. Subsequent to
that, we will then entertain questions from the audience.

I think this panel is a cross section of industry and the Gov-
ernment who can address the real world issues and the concerns
that we have for aviation simulators in the Navy today. And they
can also represent all of the critical elements that are essen-
tial to the development of a sound implementation plan. Allow
me to introduce the panel members.

On my immediate left, Mr. Jerry Purser, Manager of the Field
Services Division, Singer Company. On his left, Captain Fred
Meyers, United States Navy, Director of Training, Naval Air Force,
Pacific Fleet. On his left, Mr. Bill Eager, Director of Training
Systems, Grumman Aerospace Corporation. On his left, Lieutenant
Colonel Roger Norris, U. S. Army, Director of Maintenance, Troop
Support and Aviation Material Readiness Command. On his left,

Mr. Bob Johnson, President, Applimation Inc. And on his left,
Commander Bruce Ryan, U. S. Navy, Commanding Officer, Naval Avia-
tion Engineering Support Unit, Philadelphia. Next, Mr. Bert
Shrine, Vice President, Burnside-OTT Inc. And on the end, Mr.
Johnny Johnson, Director of Aviation Contracting, NTEC.

Why are we here? Let's talk in terms of the objectives of
this program first. Part of that objective relates to the SECNAV
decision that was finalized in June of 1982, approximately 5 months
ago, in which the Secretary of the Navy approved the phase-out and
the disestablishment of the TRADEVMAN rating, commonly known as
the TD rating over a five-year period, FY 84 through FY 88. How-
ever, let me assure you that for reasons that are very sound,
we are commencing implementation of this program in FY 83. That
decision was made after very careful scrutiny and the realization
of a couple of points. One, that the TD rating was not military
essential; that the need for these skilled, highly trained tech-
nicians was needed in the Fleet; and that the functions performed
by the TDs could be replaced by contractor support. Therefore,
the subject of today's discussion.

Naval aviation, having by far the majority of the TD rating,
approximately 1,700 of the 2,200, has the lead in this transition.
The surface and subsurface communities will commence to phase out
of the TDs in FY 85. I think you can realize at this point that
there were a couple of very critical issues that had to be ad-
dressed in a very timely fashion, and therefore, OPNAV, OP-05,
gave centralized management for this program to the Naval Air Sys-
tems Command, which was delegated to AIR 413.

First and foremost for any program which I think creates a
lot of the interest that you have in it, was to get the money in
the budget. As you well know, that's a 2-year lead time. There-
fore, in anticipation that the tentative decisions of SECNAV
earlier on last year would be finalized, we went into the budget
process last October and November and intensely worked the fund-
ing issue to justify the budget to commence the program in FY 84.
At the same time, then, we were able to identify the unfunded re-
quirement to commence that which was absolutely essential in FY 83.
Then to properly utilize that money, it was essential that a
sound management program be established, a program of actions and
milestones. In order to do that, and to fully satisfy the whole
objective of the program -- and that was to give the availability
and readiness of simulators to the user commands -- it was neces-
sary that we establish extensive and intense liaison with the
user commands. There are basically five major user commands.
After the informal liaison, we convened the users' conference in
Washington in late September. Very intensely for about three
days we worked the issues that were necessary to develop a coordi-
nated, totally integrated program. It also prepared us to come
to this industry conference and address this issue with you in
such a way that you, as the most critical team member, understood
the program as well as we do. And you in industry are the key
to the success of this program.

The second objective we also know to be attainable because of the small data base that we have had in this arena. We can realize increased availability and readiness of those aviation simulators that are in the field today and those that will be coming in. And we also know that we can do this in a cost effective manner. In order to do that, we know that we must contract with performance contracts, and I think that will serve the mutual needs of both key players.

Continuing towards the common understanding of this program, let's get into what we mean by the definition. This, ladies and gentlemen, represents our long-range goal. To accomplish it, we must therefore establish a very strong and effective Navy/industry team. For industry, we're looking to you for total support of all our simulator-peculiar hardware and software. We're looking to you to remove and replace the aircraft common components. And for the Navy, to manage and to continue to support the program even more than we have in the past through the organic repair and support of the aircraft common component. This team concept can no longer just be considered a concept. It has got to rapidly become a reality because I think most of you in this room are aware of the greater degree of commonality that exists between simulators and prime weapons systems today, and therefore, we're continuing to push the trend towards greater stimulation versus simulation. Therefore, the use of the Navy's organic supply and support system is essential, that it be properly manager, and that you properly understand it. In order to bring about the critical interface that will be essential, we are looking towards the con- tracting officer's technical representative and his team to be that on-site user-oriented, technically and contractually oriented person or persons attached to the functional wing, working with you in the areas of user requirements and understanding, the sup- ply and support system, and to make that determination with the Wing Commander when it is necessary for aircraft common components, whether that component will be put into the simulator or the aircraft -- what will be down.

As shown here, this long-range program has four parts. Opera- tions and maintenance personnel -- I have alluded to it earlier and I'll restate it. We're looking to future contracts to be per- formance contracts. Therefore, you, industry, must determine what your manpower requirements will be to satisfy that performance requirement. We have a good idea of what labor mix you need; we know what ratios you need. However, that final determination will be up to you because we are looking for availability as the mark of performance.

Training of that personnel will be the bidder's responsibility and this, to me, is no small issue. I think it's essential that we discuss that to the extent necessary and that you exercise the management that will be critical to minimize that training cost. In the initial transition, you, the contractor, will be overlapping

with the TDs. And then for follow-on contracts, the Government will make available for you the sites and the data that you need to go forth in the bidding system, the competitive system, in a knowledgeable way. We will expect training proposals from the bidders as part of their plan. Industry will be expected to assist the Government in the quality assurance inspections, whether annually or as required.

In the area of repair and logistics support of the trainer peculiar components, we basically intend to take that material, put it on site, and turn it over to you. Spares, consumables, data, publications, support equipment. Basically, what we have is going to be what you get.

That would lead me into a little bit further discussion of that issue because that's going to be the test where the rubber meets the road. Support equipment will be a mixed bag in some cases. The contractor is expected to be responsible for the repair of repairables and all replenishment. Technical data and publications must be maintained. The Navy will continue ownership; however, the contractor will maintain them. Data reporting must be in Navy format for maintenance, material, availability, utilization.

Configuration management -- we must improve it. We will retain authority. The contractor will be held responsible for the execution and the accounting, and in that area we will look to the contractor for the execution of minor mods, whether they be in software or hardware or other material. It's no surprise to you -- there will be pertubations in this goal, and I will address them a little later.

Now to look at the matter of POMS application. These are the three categories of weapons systems simulators that we plan to be dealing with. I will address each individually in terms of the contracting approach. The most pressing, I think, and where the application is very critical, is in the emerging systems. The emerging systems that I'm referring to are programs such as the FA-18, SH-60, LAMPS, MK-3, and so forth. You know that the weapon system is not stable nor is the configuration management smoothed out. We have a lot of turbulence, and as we have the turbulence in the weapon system, so have we in the trainers. There are a lot of aircraft changes and therefore there will be a lot of simulator changes.

The early material support package -- very dynamic and reasonably incomplete. And yet, I think -- and I know that the Fleet and user command supports the philosophy that the most critical time for those simulators is with the introduction of a new and emerging weapon system. Our maintenance personnel are not at their best trained level. Nor are the air crews. We are just coming on line in the learning curve, and therefore, to have that simulator is essential. That's going to take a lot of cooperation.

Once we put that emerging system on the line, get the system stabilized, the material support package fairly well established, we will then compete the follow-on contracts. Looking to the future systems, we basically plan to adhere to our long-range goal by contracting initially with the simulator prime contractor and making that competitive within the acquisition of the prime weapon system. Again, once stabilized and established, we will compete follow-on contracts and again, this is where we see the Navy/industry team coming to its ultimate and optimum objectives.

Perhaps the most challenging application is the manner in which we deal with simulators in the field today. We will compete these simulators to the maximum extent practical. As you are well aware, one critical element will be the site survey to determine the material condition of the simulator and the status of the support package. As you know, these are some of the pertubations I referred to earlier. Initially, with these simulators we plan to replace the functions of the TDs with the contractor manpower who will continue to use the Navy's organic support as it is available. Each system will be different. Performance contracts will entail a tremendous amount of cooperative effort, and it will be, to me, one of the first tests of our ability to manage and implement this program with you, industry, as the critical team member in an affordable manner.

We intend to complete the support package and turn it over to the contractor. We also intend to transition from the Navy organic support system to contractor management and replenishment of the support package where and when possible for trainer peculiar components.

The COMS program is basically underway. We will continue the COMS effort in the defined manner, as you have just heard, for the on-going programs; for the new and emerging systems -- FA-18, LAMPS, MK-3.

Those were two of the reasons why we had to rapidly implement this program into FY 83. The third reason that we're bringing the program into FY 83 is because you are aware, in many cases, of the problems that we have with some of our most complex simulators such as the E2C, the S-3, F-14. Looking at this implementation plan, you can see that we start off in 83 and the program increases rather dramatically over the next several years. Again, we must have strong and effective management from both parts of the team.

In summary, I'd like to address what I think are some of the concerns that I have and some of the expectations. I reiterate that this program is designed to not only replace the functions of the TDs, but to give the user commands the availability and readiness that they have demanded for so long. This is a user program, ladies and gentlemen. Our sole purpose in this, whether it be industry or those of us in Washington and those of us here

at NTEC or wherever, is to work in total satisfaction of the user's
requirements. Fleet aviation readiness is critical to the use of
the prime weapons systems simulators and all those in the training
command and in the Reserves, as well. The organic TD support is
decaying, so therefore, we are fully committed to this program.
We do have funds in the FY 84 budget, and we have been assured of
the funds to implement, as an unfunded requirement, in FY 83. The
program must work and it must work well. Let me simply state what
I expect of myself and the Government and that is to obtain the
stated objectives within the affordable funding. What do we ex-
pect of you, industry? Simply stated, to provide a competent, re-
liable service while making a fair and reasonable profit. I look
at that, though, that you must be committed to the fair and reason-
able profit in the long run and not the short term. We simply
cannot afford to go into this program and price ourselves out of
business. The cooperative effort of everyone will preclude the
Navy and the other Services following, I think, from turning to
alternative sources. If we do this program wrong, the penalties
are severe. However, if we do it right, manage it well, the
rewards will be great.

I will now sit down and turn the next three minutes over to
Jerry.

Mr. Jerry Purser

Thank you, Captain Scott.

I'm with the Link Flight Simulation Division in Binghamton.
Our main objective is to provide simulators and training devices
and the appropriate support to the customer for them to meet
their objectives. In doing that over the years, we've found that
there are several elements that you must consider when putting
together a support package. Those elements have been covered
partly by Captain Scott -- the organizational level maintenance,
intermediate level maintenance, and depot level. The fourth item
is the material that makes those first three items successful,
and how that is handled must be in a way that you can respond to
the requirements of the Navy's availability requirement. The
hardware and software configuration is very important and also a
sixth element would be how we would provide them with operators
if they so desired. In doing that over the past, we were supple-
menting the TD. We've done that by having contract maintenance
technicians; we've done that by having contract engineering tech-
nical services; we've also done that by having interim contractor
support while the Navy was bringing their people onboard. As we
go downstream and since we no longer are supplementing the TD,
we believe that it is in the best interests of the Navy and any
of the other branches of the Service, or any of our customers, to
look at all six of those elements and have a total support package.
We believe that would give them the most effective means and the
best cost effective means of meeting their objectives.

Captain Scott

I'm going to skip over Captain Fred Meyers and move on to Bill Eager because I feel that Fred should wrap up these 3-minute comments as the ultimate user.

Mr. William Eager

My name is Bill Eager, Director of Training Systems at Grumman Aerospace. We've heard, during this conference, many comments relative to . . . battle group and sophistication of aircraft. Our principal endeavor at Grumman Aerospace is building aircraft. We build them, we have heard during this conference, in inefficient quantities. That's because they're very sophisticated. The trainers and simulators built today to train flight crews, such as the E-2C NFO operators, are extraordinarily complex. We have been supporting these trainers consistently. Our plan at Grumman is to continue the support of these trainers. We feel, through the extension of our support services organization at Grumman, these trainers will be supported in accordance with the desires, the availability desires, of the Navy.

I would like to think in terms of the future. I have very good perspective into what is going to happen to the E-2C, the F-14, the A-6 and the EA-6B, principally due to the position in Grumman that I direct an organization that reports to the same man that directs all those aircraft programs. I see great economy for the Government in connecting the changes, the ECPs, the changes that are being demanded by the threat changes that will ultimately go into the simulators. Those aircraft changes and those modifications to the simulators must be connected somehow in this process with the aircraft prime.

Lieutenant Colonel Roger Norris

My name is Roger Norris. I'm here to tell you how the Army has solved its simulator support and show you the concepts . . . Our maintenance concept is contractor logistic support. For contractor logistic support, we have turned the requirement over to a contractor, and we want 90 percent availability. He has the responsibility to provide the Army with FO maintenance down to organizational level. How he mans, how he does that is up to the contractor. This concept has been very successful with the Army. We require 90 percent availability; in fact, we have exceeded that by some . . . percent. The reason why the Army is in this position is that simulators are getting very sophisticated and to expect a green-suiter to be trained and maintain that proficiency and being at a location long enough to provide the support we need is not very logical. So we've gotten with the contractor logistic support and it's been very successful to the Army, and we think we will continue this way.

The only other thing we have done is that software support is a little . . . than our contractor logistic support of the simulators. Software support is provided in-house by DA civilians.

Mr. Robert Johnson

Thank you, Colonel. My name is Bob Johnson. I'm President of Applimation, which is a small business, so I'd like to express a few ideas from the viewpoint of small business, although I can't speak for all small business.

I think this is a tremendous growth opportunity for small business. I think it's a chance to enter a field of growth with great growth potential, with a relatively small investment of capital and resources. Again, speaking for myself, we're currently not involved in contractor support activities other than the interim support activities that we provide with our simulators. I'm looking forward to the ensuing discussion that I hope will take place after this because to me, there are a lot more questions around than there are answers at the present time.

Although this is an opportunity for small business, I would like to point out a few areas of concern before small businesses walk into the lion's den. First of all, I suggest that the small business know the specification and know the equipment and the requirement that they're about to get into. Being the low bidder may be great for the company to begin with, but failure to perform on the contract could not only jeopardize the whole concept of support maintenance, but it also could be very difficult for the small business concern itself.

The second point, be sure you have access to adequate resources and if you don't have adequate access to resources, I think the team concept for small businesses on this is a logical way to go.

In summary, I think it's a great opportunity for everybody but I think especially for small business, and I assume that the Government will set aside an equitable amount of small business set-asides for this concept.

Commander Bruce A. Ryan

Thank you, Bob. I'm Bruce Ryan. I'm the CO of NAESU, and my experience with contractor technical services includes both the acquisition of technical representatives and maintenance technicians for naval aviation. It runs to 2,000 such people provided to me by 107 different companies, 99 of those being prime contractors, and by that I mean hardware manufacturers, and 8 by personnel services companies who have no prime contractor affiliation. What I mean by that is job shops. As a contractual vehicle, I use a firm fixed price indefinite quantity labor hour contract based on a man-day rate. Contractor maintenance services account for about

$20 million of a $180 million annual budget. It includes organizational, intermediate -- in some cases, both, and in some cases also operation of aircraft, engines, automatic test equipment, and precision measurement equipment.

In my case, the decision to compete such services, rather than direct the procurement to the manufacturer, has been driven by both the DOD position to increase competition and by the very real problem of not being able to afford the personnel costs of the prime contractor. The basis for sole sourcing a maintenance contract to the manufacturer is clear in the early life of a system. But as the system matures, the argument loses clarity. The desire by the manufacturer to stay involved in the maintenance of his system is strong and valid. The desire by the Navy to keep the prime contractor involved is also strong, but the reality of available dollars, however, and the fact that it has and is being done successfully by others dictates competition.

Given that competition is a way of life in contractor technical and maintenance services, there are three options, in my view, available to the prime contractor. The results of these three options are all acceptable to the Navy to varying degrees. The first is to recognize that we cannot afford personnel costs and to a greater extent every year, aren't paying it. Restructure your cost accounting system. Set up a separate cost center for field services, carrying minimum burden. Bid and win the competition. Your benefit -- you maintain your equipment. Our benefit -- your incentive to keep your gear operating.

Now, I've been told by numerous companies that this is unrealistic. There is at least one major prime manufacturer represented here today who has done exactly that successfully for six years, performing on Navy field services contracts.

The second option is to team with a personnel services company. Utilize his people as the journeymen, mechanics, and technicians, 80 to 90 percent of the tasks involved. Utilize your people for the supervision, on-site and in-plant. Bid and win the competition. The benefits to you and the benefits to the Navy parallel those in the first option. One major aerospace firm is employing that concept today, for Navy aircraft and system maintenance on a limited basis, successfully.

Lastly, exercise neither option that I've discussed. Competition will most probably be won then by a personnel services company without tie to a prime manufacturer. His motivation in performance is, of course, to stay in business. Our benefit is that desire by him to stay in business. We have demonstrated in the Navy that we can satisfactorily accomplish the maintenance of our aircraft systems and equipment in this fashion. Business as usual is going to put me out of business faster than anything else that I do. The decision to compete has been made in this case. The response is up to you.

Mr. Bert Shrine

Thank you, Bruce. My name is Bert Shrine. I am representing Burnside-OTT. We are a personnel services company and quite honored to be invited to participate in this panel.

Our various services contracts with the Navy to date, specifically the Chief of Naval Air Training, have indicated to us that the concept of civilian personnel services contracting can be, number one, very productive; number two, can markedly improve the level of services provided; and number three, can be accomplished at a substantial cost savings to the Government. We view the simulator maintenance field industry, as Captain Scott put it, as a natural for this type of program and our participation in it. While we have a certain regret for the personal trauma suffered by those active duty people in the TD rate, we welcome the opportunity to expand our scope of operations to serve the Navy in this new field. Quite frankly, we're fraught with curiosity as to the precise wording and programming that will eventually present itself in print in the RFPs so that we will be able to determine just to what extent and how we will be able to go about participating in the competition for the simulator maintenance industry that the Captain has described.

I did it, George, in less than 3 minutes. Thanks very much.

Mr. E. E. Johnson

You've already heard my name. I'm Johnny Johnson. I'm really here, I think, to be the gag or the muffler of this session. We are already in a competitive and sensitive arena. I do hope that we do have good questions, but unless you see your friendly contracting officer up here nodding his head, you'd better just wait and read the solicitation.

Regarding the 3 minutes that Bert just mentioned and what Scotty put us to, you know, when we tried to prepare for this session, Scotty said we would be limited to 3 minutes. We kept asking, "What are you going to say, Scotty?" I have nothing left to say. But I am reminded of a story I recently heard over a radio program that would move toward this transition. It was a local talk show -- some of you are familiar with those, where people call in and want to discuss a subject that they're usually not too well informed on. This particular individual called in about the bureaucrats in the Government and the cost to the Government. He ranted on for some time and said, "The Government is so costly. In the Department of Defense, it takes three people to replace a simple light bulb." A second caller said, "I would like to respond to the first caller. That figure is inaccurate. It's totally untrue. I am in the Department of Defense. It takes five people to replace a light bulb. We contract that out."

The . . . in this business is the type of contract, and I'm
sure you're going to hear some of that come forth. But to be a
little bit redundant, I'll tell you how our solicitations will be
written and there will be RFPs. It'll be a negotiated execution.
The solicitation will describe technically the trainer. It will
state the availability that Scotty referred to, the requirements,
the specific availability, and we will ask you to respond by
giving us your plan to achieve that with the proper mix of per-
sonnel, your mobilization plan, how you intend to recruit, train
and operate, and we're going to bounce that against our prescribed
criteria for judgement, along with the costs that must be reason-
able and affordable and hope to pick a successful winner. Then,
when we're going through the contract administration, . . . the
user and you'll hear Fred wrap up on some of his concerns for
this. But it is an intent to be user responsive, and he will be
playing a major role in identifying the . . . . . In the type of
contract, we may have a multiple of different blends, from a
fixed price to a labor hour, as was mentioned earlier, and I see
cost plus award fees coming forward. I do look forward to manag-
ing this contract effort.

Captain F. P. Meyers

I'm Fred Meyers. I'm COMNAVAIRPAC on the west coast in San
Diego. There are two reasons why I have to go last. One is,
Captain Scott promised me my last bad ice cube would melt and the
other one is, I am the user. I've heard a lot of words here in
the last 2-1/2 days and I've listed them all down here. Unfor-
tunately, I can't read them because my glasses don't work. But
like affordability, maintainability, procurement, acquisition --
it goes on and on and on. We at the user level take all those
words and put it on this side of the scale. We take all the people
that say, "You've got this much money to do this with," we balance
that on the other side of the scale, and down at our level, we
use the word "readiness." We do readiness through training. I've
been on both sides of that fence, and I can tell you what training
really is to the people down in the real world. He may not under-
stand these words that we've been hearing here the last 2-1/2
days. What he does understand is what kind of training he's got-
ten, how much is he going to get. I heard in a session the other
day, and I'm not here as a user to throw rocks at anybody, about
the 10 percent extra training versus 10 percent in the equipment.
I'd be willing to bet you, all you ex-military people and the
people still in the Services, if you go out and ask that young
air crew if they want that extra 10 percent, you know what the
answer is going to be. He's not interested in funding, he's not
interested in maintainability, the COMS program -- that's our job.
He's interested in one thing and that's training. I, as the user
say, we're now to the end of the conference and this is where the
rubber meets the road. I've got to be able to put these people
as an all up around, if you will -- that's an acronym that means
he has to be fully trained, out in the Fleet. If I can't do it,
then I'm not doing my job and the boss out there and on the
firing line is not getting what he needs. I hear about it, I

get to go talk to somebody else. I view at the user's level, the people that have to do the training -- two things. First of all, this has all been a new type of evolution for us, a new era. We've been overwhelmed. We need to educate our own people at that level. We need to get the people who are responsible for the training in military involved, because after being here 2-1/2 days, I realize we are not up to speed yet.

The last thing is, and you've heard it here at the table, we not only need to communicate with the industries, we need to be able to tell you what we want, what we need, and the end line to that. Hopefully, when we go back we're going to have some of that answered.

Captain Scott

Panel, you've assured me when I stopped you in our preliminary sessions just to get to know each other, that you would not let me down by taking the issues right up to . . . Therefore, for the next few minutes, you've got it. We'll try to keep it limited to one person talking at a time.

Panel Member

Scotty, we've spoken often relative to the CMS operations. We've spoken now for the last six months since you've been planning this and getting the responsibility for it. The key issue, as I see it, is to understand and get the grading down to where there is performance. I know you want performance out of the contractor; I don't know what that performance will say -- 90 percent, 95 percent, but I'm dreadfully concerned about the subjectivity of how that's going to be arrived at. It's very hard in the Navy system, the supply system, the data system, the personnel system, the TDs that will still be there at . . . Island doing EA-6B trainer work while Grumman or the successful contractor is maintaining the A-6 trainers. I think those issues still ought to be defined and I understand that site surveys will be made, and I certainly hope that the people representing the . . . will be involved in it, because I guess my question is, who is going to turn the lights on and who turns them off at . . . Island? I think that's going to be a key issue and we really can't overlook that. Johnny Johnson, when he formulates the RFP and puts the contractual language together; the people on-site; the people who will monitor it must be trained, educated, and they must know what's in the contract. I think the surest way of getting a lot of Admirals involved and negative discussions going on on that project is for a misunderstanding to evolve at the beginning. So before we begin, let's hope everyone knows what the requirements are.

Captain Scott

I think that can be answered in a couple of parts. First, I'll go back and remind you of where I said there are pertubations in

the program and these are some of the pertubations that we know exist, our material support package not being complete and adequate, maybe a deficiency in a publication, support equipment where we've been pooling it now will be broken apart in some cases because it belongs to a specific simulator. In other cases, we still will try to have the support equipment available on a mutual basis because in many cases, we will have more than one contractor in a given building. In the simple cases where the building is of one weapon system, that makes it nice and easy to know who's going to turn the lights on and who's going to clean the deck and so forth. Basically, for those types of things, I think that they can be worked out as we go through the site surveys, discuss it in depth. I can generally tell you that we expect the contractor to maintain those spaces which he immediately occupies. The station is going to have to come on-line in some of the common areas. That's going to have to be worked out. Johnny, I'll let you speak to how you plan to put it all into the solicitation.

Mr. Johnson

Again, I'm so taken aback, but I'm going to depend on Mr. Ed Baker and his team from NTEC. How many teams do you have working right now, Ed? Four teams. They're traveling to these sites now with the user and attempting to identify the statement of work, the conditions of the trainers, the support materials that are there, and the configuration, which I hope will come out clean. Again, the site survey, as Scotty stated, and more important, the questions that will be forwarded to me in every case. It will be a routine and . . . for us to go back and clarify our solicitation. I expect to see more of that than I would like to see, but because it is new and of fluctuation to us, this will be the only method I know to really tie down something and we can put everybody on an equal basis going in.

Commander Ryan

. . . . . that the Army is using and there it has to be kind of easy to tie availability of a device as a performance criteria on a contract, because the contractor is sparing his system, is writing the pubs, updating the pubs, and performing the maintenance. It's going to be difficult, without question, to try and tie performance to a contract like this when there are so many other facets involved. I, for instance, have an I-level contract for I-level maintenance of the C-9B, and you can't tie performance on that contract to aircraft availability because the sailors are doing the O-level maintenance, and the pilots and the air crew are breaking the stuff. You can't even tie parts availability at the I-level to a performance criteria because what do you do when the sailor or whoever else is driving the truck that pulled the part out of the airplane goes around the turn too fast and it falls off and bounces? The contracts that we have for contract maintenance services, the performance criteria is not specified in terms of availability. The quality control is effected by a monthly

certificate of service, which is effectively the acceptance document for the individual. It's signed by my officer in charge onsite in most cases, or the AIMD officer where I haven't got one. The way I implement that quality control is via a unilateral right of termination at no cost to the Government for any of three possibilities -- the task requirement ceases, the individual is determined to be technically unsatisfactory, or his or her conduct is prejudicial to good order and discipline, which covers a multitude of sins. It's interesting to note, however, that in the over two years that I've been at NAESU, we have never had to implement the unilateral right of termination amongst some 2,000 employees of over 100 different companies. The fact that that provision exists causes the company with the offending individual to solve the problem, and we have found that we've been fairly successful. You've got a mouthful to chew off . . . .

Panel Member

I don't disagree with that at all. I can only say this, though. The default is not acceptable. As Scotty said, going in, this thing has got to work. We've got no alternative or quick alternative to bring back on the TDs, so it is a selection process that we choose the right performer up front and design and negotiate that contract to accommodate the task at hand.

Captain Meyers

There's a little . . . I'd like to hear this panel discuss that hasn't come out here yet, as the user level I not only worry about the 90 percent or whatever figure you're going to come up with availability of that trainer, I need to know what it can do. I need to know what mission the essential equipment that works on an airplane to give me enough trainer. If the radar doesn't work, you can do other things. I may be able to do some training or . . training, and that has to be ironed out in the contract. Hopefully, we're going to be able to spell all this out to the NTEC boys so that we understand that, and that is probably going to be the most difficult to put in that contract. In addition to the . . . , or whatever you want to call it, I need to know what it can do.

Panel Member

If I might comment a little bit on our experiences with a maintenance services contract, a couple of items. First of all, and key to the whole thing, is that we have found that when the contractor deals with the Government in the spirit of mutual respect, the chances for success are very substantial. When that circumstance does not exist, the opportunity for things not to go right fall down quite rapidly. I would hope that all of us could go into this program with the idea that the contractor has the Government's best interests at heart and that the Government would accept that, because it will help the program one heck of a lot. The second thing is that when you go to write the contract and you

start talking about performance and performance measurements and so forth, we would urge, from our experience, that if the contract or the circumstance does not lend itself to a firm fixed type of contract, you go to an award type of thing that is subjective enough and you do not fall into the pitfall of trying to quantify that which is not readily quantifiable and use that as the basis for performance, because that will create grief of a high order of magnitude for all concerned. It is possible to create an award type of performance criteria that take numbers and translate them into subjective evaluations and to do it pretty successfully. We would urge those, but there's nothing but trouble on a VFR clearance when you try and take pure availability and say that is the measurement of success or failure, because it's just not that simple in most cases.

Lt. Col. Norris

Some of these concerns that have been expressed here at the panel by the Navy are also of concern to the Army. One way that's gotten around it is that it's a total maintenance concept where the contractor is, in fact, responsible for all aspects of the maintenance support, to include supply support, manual support, of the simulator. To gain all the benefits of it, this total concept is you have one contractor performing maintenance on all of your simulators. There have been some comparisons made here at the table, comparing the simulator with an aircraft, but there is quite a bit of difference. Even though the simulators, to mimic an aircraft in its missions, the majority of the simulator is the computers and it's in a hard, fast installation, and your problems associated with a flight simulator are basically computer work and not aircraft hardware. I think if you're going to benefit on your support of your simulators -- I'm talking about you, the Navy -- you've got to have a contractor that can take test equipment, consolidate test equipment wherever he needs to, or spread it out to really provide you the savings you need. If you want to fragment the different contractors at different installations, you're going to also have to duplicate some of your support, some of your support equipment, and you're not going to gain all the benefits of having a contractor doing all the maintenance.

Panel Member

I'd like to respond to the availability question. We have found in each one of our contracts that the availability was based on a judgement that the simulator was available to meet the mission requirements. That's what the Captain here is looking for and that's the criterion that we've used in each one of our contracts. Having a simulator out there without having a single discrepancy is pretty remote. To have only discrepancies that would not interfere with that particular mission, we would call that simulator in commission and they would utilize it. The other response, in each one of these programs they've also been fixed price and we've been able to negotiate, been able to maintain those simulators at a fixed price type contract and I prefer a fixed price type contract.

Mr. Johnson

I'd like to jump in on that and I'll assure you that we're
going to take some lessons learned from Fort Rucker, but we are
going . . . competition. That program SFT in the Army has been
sole source from its birth. They tried to compete a few years
ago and one of these days I'm going to find out why they didn't,
but it doesn't really totally mean spend more money, but along
that context, the Air Force gets the biggest charge of the DOD
budget, and then the Army, and the Navy is down here. So, to
echo what Scotty says, we're going to stay within an affordable
program. We're going to compete it. The contract will be a one-
year contract with four options and unless something goes wrong,
we fully intend to exercise those options when they're advantage-
ous to us. They will have phase-in, phase-out, and should we
compete and change contractors, we'll have overlap and that will
be taken into consideration. I'm not scared of a cost plus award
fee contract, and by the way, you guys are helping me a little
bit with my sponsors and the money boys. I think it is a predic-
table outcome when we go into a cost type contract in this arena.
We're buying, again, bodies per se, and we know what the labor
rates are and when they're going to change. There is . . . .
that we'll have some premium time to get that availability we're
talking about up to it or something to respond to a change in
schedule. I'm not scared of a cost type contract. It will accom-
modate most of the incidents that have been pointed out up here.
I'm about ready for some questions from the audience.

Lt. Col. Norris

Before you do that, could I answer the questions you're asking
about the Army in a competing contract? I tried to preface my
statements about the concept being a contractor logistics support,
I think the Government has to ensure it is in a position to com-
pete any contract it sends out and in order to do that, you've got
to ensure that when you procure a new item, you procure a support
package that can be used by anybody, not just the prime contractor.
The Army did not, a few years ago, go competitive and it was a
consciencious decision in that really, you're looking at our simu-
lators that we have, even though we've got 17 different sites, we
have basically the UH-1 flight simulator that is fielded, in opera-
tion, and which the Army presently has the data package. The other
devices that are coming now, we have basically a prototype located
at one location at Fort Rucker. We have, just this past year,
fielded three CH-47 simulators but we're in a process of obtaining
those data packages. Until we get the data packages on all the
simulators, if we went and competed anything, it would be strictly
the UH-1 flight simulator that would be competed and if that was
done and then we had the prime contractor maintain the other de-
vices, we'd be in a situation I just cautioned the Navy about.
We'd have duplicated support, facilities, and equipment, and that's
what we want to stay away from. That's why we conscientiously said

we want to stay with the prime contractor now until we get all of
our simulators fielded with the support packages.

Mr. Johnson

Roger, I'm not worried about seeing that one. I'll be retired
and long gone before you get that package perfect.

Mr. Eager

Scotty, I'd like to make just one quick point. There is a con-
cern that we have to look at the flexibility in the relationships
that we develop. Flexibility to the point that we are presently
experiencing substantial increases in training requirements at
Miramar in the E-2C area where they're going 14 or 15 hours a day,
7 days a week now. The interim support that we're supplying at
that site, we're cranking our people up to work 7 days a week. So
those are the things, the variables that will occur. With the new
missions in South Florida for the E-2C, we're cranking up substan-
tially at Norfolk for additional training. So there has to be
some flexibility clause that will allow the Fleet people to direct
the contractors in performance on-site, immediate. I don't picture
it flowing back through NAVAIR and NTEC to get a contractor to put
on a Sunday shift if they're going to 7 days a week. So we have to
have that flexibility.

Captain Meyers

I'd like to add a comment, too, from the user's standpoint.
The user is not a contracting officer and he's not a procurement
specialist and he's not really a COTR. He's got a job to do and
he's got to get it done when he has to get it done. If a require-
ment gets laid on him, he has to meet it, and he will require
whatever is necessary to get it done. If that is 24 hours a day
over a 3-day holiday because I have got to get crews out this
Wednesday instead of next Wednesday, he is going to say, "do that,"
and whoever has the contract is going to do that. Flexibility
that I hear Bill talking about is that very flexibility, and given
that flexibility of performance requirement for availability over
a period of time, I see it going out the window.

Mr. Johnson

I think we're bordering on type of contract to accommodate
flexibility. Any type contract will accommodate that. If the
job's got to be done, it changes provision, and the contracting
officer says, "Move." All you have to do is send money.

Captain Meyers

My suggestion is that that will be a continuum as opposed to
an issue here or an issue in three months.

Mr. Johnson

I said I'll support the cost contract, but send money.

Question

I'd like to ask a different question, if I might. We had a whole list of contracting devices on the board there a moment ago Has it been determined if the Navy is going to procure the support by suite, by site, or by individual device? Has that been determined, and if so, what is that?

Captain Scott

We're getting down into some of the essential details, I think, now. Basically, we plan to contract by weapons system, but that has to also be a very flexible issue because the way we have procured training devices doesn't allow for any one solid system to maintain itself. FA-18, we've got Sperry, we've got Gould, and hopefully, Hughes is going to be on-line with theirs before long. Therefore, we will be contracting by system, simulator systems, whether it be PTTs, OFTs, WSTs, WTTs. If we have a weapons system where one manufacturer made all the trainers, then that will be simple. We can operate in that way. I think it's now time that I introduce a subpanel member. Sitting immediately at my one o'clock in front of you is my Program Coordinator, Commander Ron Smith. Ron, stand up so the people can see you because you're going to be the person, along with the next one standing up, that's going to answer all the detail questions that follows this discussion today, Mr. Ed Baker, the Technical Coordinator from NTEC. These two gentlemen are heading up the task force to work the details that are essential to make this program implementable and properly maintained and managed in the very critical time-frame that we are operating in. One thing that hasn't come out here and I'll go ahead and lay a little bit of groundwork on that, if you will recall, back on the initial slide I had up there, Operations and Maintenance. The energy of this discussion has been around the maintenance, but don't forget we are talking about maintainers who at least have some in their group who can be the operators of those extensive consoles that exist with the extensive systems where you've got to walk at least 20 feet to get from one end of the thing to the other. So we've got to have people who are not instructors, but they understand how to operate those consoles to make the systems perform for the crews. If it's necessary, they will be backed up by instructor personnel who are smart in the tactics and so forth that will be employed. You're talking about a package. The Navy will retain the ability to provide the instructors where necessary, but we're referring to tactical instructors, not the operators of the consoles that make the systems come on-line, operate the way they should, and respond in the manner that they should, and also participate in the debriefing. That really has been one of the critical things that has led me into insisting that we have this flexibility and subjectivity in the contract. Yes, it's going to take a lot of

effort, but it is essential that we work all those details out up front and that COTR, that contracting officer's technical representative and the people who are working with him, must have the training that is essential for them to understand how to do their jobs. There are going to be demands for Saturday or Sunday or a late night shift which was not planned. The flexibility and the subjectivity that the Wing Commander needs must be there. That cooperative attitude -- you can make your availability mark and the functional wing thinks you're the biggest SOB in the business. What we want is that cooperative team effort that says, you're invited into our ready room because you're going to be operating that system and supporting it and cranking it up for us and working with our crews. Come on up and let's talk. Let's get to know each other so that you understand out problems and we can better understand yours. Therefore, working closer together. We're looking at it long range, gentlemen. Therefore, just because you're the contractor, it doesn't mean that you can't be part of those squadrons and air wings that are using those devices on a daily basis.

I will reiterate one point that I heard earlier on. I think for a lot of you to stay as competitive as you would like within what I know to be the affordable funding line, you have got to take some serious looks at your management in the way of cost centers. I can't afford your big corporate across-the-board overhead. The companies that are providing the most successful in the small data base that we're operating today have been those that really have segregated their cost centers and established a cost center that deals with the field service only. I don't manage your companies, but I sure can give you what I know to be a real concern to me in being able to afford the program. That's one of the critical elements that I see.

Now, let's get it fixed up a little more. A question from the audience.

Question -- Cannot be heard

Captain Scott

What are you going to do? Hold me legally to it?

Mr. Johnson

Let me talk a little bit, because that is a sensitive thing. You can't hold him to it. His planning job, it'll be a little bit different execution. I can say this -- the first of our series has already gone to Commerce Business Daily announcing that solicitations will be forthcoming shortly. You should see that in the CBD next week.

Captain Scott

On this slide, that's where we are today at this hour. If we have one go critical tomorrow, that program can change.

Question

I have a couple of questions that I hope are short ones on implementation that precede FY 83. The TDs are being phased out. That's a fact. How soon are they being phased out? Are they going to be on scene for five months, six months, four months? Do we have any feel for the guys that are operating the trainers right now and how long they're going to be around?

Mr. Eager

You're looking at 85 or 86, Admiral.

Question

No, no, no. In the aviation community, we have x number of TDs that are presently operating the trainers, like at Miramar and so on. They're going to be around for awhile?

Mr. Eager

We're phasing out certain ones at certain times, depending on how we're going to handle that, but they'll be around for awhile.

Comment

I assume they're going to be around until the contract is let that takes over the function of the training so there's not going to be a hiatus in the training.

Mr. Eager

Hopefully, we've got some cross-over for training, because we just can't drop it and take it up again.

Question

You mentioned things like having a survey. I assume the survey was to determine what the status of the trainers are, what the equipment is, whether they're performing or not right now. My question for you would be what are the TDs doing now? Can't you ask the people running the training right now what the status is?

Mr. Eager

Yes.

Question

Don't you get an answer?

Captain Scott

Yes, but you won't like the answer. I had two objectives up there. First, replace the functions and second, to increase the availability because the job we've been doing hasn't been very satisfactory. Now, we do know, through the efforts of the Navy's organic ability, as well as the prime contractors, in most cases, exactly what the material condition as well as the support package is with each individual trainer. These gentlemen have got teams that are going out and working with the TDs to establish that so that when we go forth with solicitations, we can allow you to look, if you need to, and tell you exactly what we've got, what the condition of the trainers is, and so forth.

Comment

I'm getting a little better feel for Mr. Eager's toe dance, then, because what you're really not only saying is that the function of training is not being performed satisfactorily now.

Captain Scott

That's not right.

Comment

So he not only has to take over the job, but he has to bring it up to the level that the user needs.

Captain Scott

My second objective -- increase the availability and readiness of the trainer. That's the reason that I was able to convince the Congress, which you heard yesterday, but before that, OSD and NAVCOM that the funding was absolutely essential and let me assure you, those analytical whiz-brains in Washington are not sympathetic to our problems. That was our most critical issue that we had to deal with following the SECNAV decision. Not just to replace the functions, because that was unsatisfactory. We had to increase the availability and readiness.

Comment

One more quick one and I'll get out of your hair and let someone else have a shot. Is there any thought that anybody other than the guy who built the trainer in the first place is going to be the contractor doing the first shot on the present systems that exist now?

Captain Scott

On the present systems that exist in the field today, close to 187, inasmuch as possible and practical, we will go competitive to start with. Now, we do have some trainers out there that there is no way we're going to go competitive because their material condition is such that if we don't bring the prime in for at least a short time, sole source, so to speak, we would never make it and you couldn't either. There are some very difficult tasks out there.

Comment

That's generally the condition of the whole training system.

Captain Scott

No, no, no. Just because we have one or two or three or four that are in bad shape doesn't mean that the whole -- the P-3 suite is in beautiful condition with a nice support package, and there are others and others and others. The ones that Bert Shrine is familiar with in the Training Command -- pretty good condition, old but they're working. They have a good support package in most cases. So in the majority we will be going competitive for the existing systems right out the chute.

Panel Member

Admiral, I think I'll answer your question. Yes, we've got some bad machinery -- you know which ones they are. You live out there and that's why you're asking the question. No. In the other . . . we do. In the S-3, the P-3 and those areas, A-6, EA-6, the ones you keep talking about, the 2F-112, which is the F-14 yes. The TDs cannot maintain that piece of machinery and I'm not here to argue with who built what when. What I'm saying is, we haven't done it and that's why we have to get on with it.

Comment -- Cannot be heard

Captain Scott

I don't know -- would you even want to buy into one of those down there, Bert?

Mr. Shrine

We don't turn down any challenge without giving it a hell of a good look.

Question

I want to address this site survey again. As part of the site survey, is it going to include such a thing as a QA&R so that

everybody understands the actual condition? And is that going to
be spelled out in the RFP so that the poor guy who's going to bid
on this thing knows that he's got a dead dog on his hands?   We
have them out there, Captain.   I've lived with them for 8 years.
If, in fact, that is going to be the criteria, when the contractor
gets the contract, whoever he may be, would a prebailment inspec-
tion between the Government and the contractor be the case so that
we all start out with the same 1 inch that we're going to try to
get to a 36 inch yardstick on someday?

Captain Scott

I think I can answer that in a number of ways. We are wrestling
with that problem very intensely. I'm looking at Ed and he's
frowning because he knows that he has a tremendous task before him.
In many cases we are aware that we can do the QA&Rs, we can do all
the site surveys, and there is going to still be a difficult way
of totally definitizing what the exact condition of everything is.
Is there a page missing in the publication? I don't know and
probably nobody else does. That's a risk. What we've got to do
is bring it down to where the risk is acceptable to both parties
and affordable, and then we may well have to look at trainers like
you're referring to and we've been talking to particularly, and say
we can't go forth immediately with a 90 or 95 percent availability.
Given the state of the trainer material support package, we may well
have to accept for the first quarter of a contract a 60 percent
availability or a climbing curve availability to get out at the
six month or nine month interval or by the end of the year.

Comment

You answered my second question -- whether or not we were going
to get a learning curve in here.

Question

For two years, roaming around discussing this contract mainte-
nance with various people in the Navy, they have been afraid of
having a 36 inch yardstick by means of which to measure contractor
performance. Having been an old aircraft maintenance officer for
many years, when you report aircraft readiness, we have an instruc-
tion that does that. Since the simulator is supposed to do the
same as the aircraft, and if that simulator is going to be used
today to simulate a particular mission, then it seems to me that
it's pretty easy to determine whether or not that simulator is
available for that training session to support that user, simply
by going to a . . . list.

Captain Scott

I agree with you. That's what Captain Meyers said a while ago.
We know exactly what's expected out of the trainer, what it's capa-
bility is, and if we've got a mission scheduled for it, it's either

up or down and you can't get into the middle. Those are the things
that we know now. We brought the simulators along with their regu-
lar maintenance system; the NAMP manual -- if you're an old mainte-
nance officer you'll understand the NAMP manual -- we now have the
simulators a part of that. So we have our system now working and
available to respond in the same way as the aircraft maintenance
system.

Question --   Cannot be heard

Mr. Johnson

I can say this -- if it is something that you don't know what's
inside that black box and you want to be like Bert and give it a
hell of a challenge, I suggest that you work a teaming arrangement
with someone who can open that box for you. This was brought up
earlier in the panel preparation this morning about proprietary
rights in the contract. There is proprietary rights in proposals
but, ladies and gentlemen, once that contract is signed, it is a
public document and anything that will make that contract operate
is there. We no longer have a secured proprietary right in the
contract.

Question -- Cannot be heard

Captain Scott

Well, Jack, you've been around as long as I have and you know
the answer to that. Thank you for asking it, anyway. Some years
ago, and I know that Captain McHugh and I were at the Fleet at
about the time that those kinds of policy decisions were made by
the Type Commanders, basically that policy has continued to be
supported and that is that unless it's an operational mission, the
trainer gets the priority on the part. But that's where, again,
the Contracting Officer's Technical Representative, and in many
cases I think he would possibly be in uniform and if he's not,
he'll have a uniformed man right beside him, that working with the
functional wing, they will make that determination on the spot.
If, in fact, the part goes to the airplane because it is needed
worse there in the decision of the operational commanders, then
you, the contractor, are not held responsible for that.

Captain Meyers

Let me add a little bit to that. We do that right now, by the
way, in the contracts that call for organic support, as far as
we're concerned in the user's world, the trainer has priority.
The only people that have priority in the Seventh Fleet is the OP
Commander out there who needs that part and we're out of them.
Otherwise, there's no doubt in our mind which way we're going --
it's going to be the trainer. But that may or may not be a part
of the contract, depending on how it's written up, whether you support
or whether we use Navy organic support, but we do do it that way.

Question

I'm from the Air Force, Headquarters SAC, and my question is
how much government surveillance or quality assurance do you en-
vision, who's going to do that to protect both the Government's
rights and ensure the contractor's rights are seen to on a daily
basis, and does the Navy envision that that might be a separate
skill now? Your training device technicians are going to go
away as you civilianize, and so I have some concerns where you're
going to get the people to monitor these contracts for you.

Mr. Johnson

If I understood your question, is it where are we going to
get the people to monitor the contracts? We've got too many of
them. We've got more people managing than we have working.

Comment

I didn't say managing, sir, I said monitoring -- the technical
person who understands the contract and understands the technical
job that the contractor is doing so that he can see that that job
is, in fact, done, that data is kept current so you can recompete,
that spares are updated, those kinds of things.

Captain Scott

Captain McHugh in the Naval Training Equipment Center has some
200 FIRs, I think, in the field right now that are highly compe-
tent in the technical aspects as well as a lot in the contracting.
Those will remain. We have two big organizations in the Navy
called FASOTRAGRULANT and FASOTRAGRUPAC. As an internal Navy
management issue, we're dealing with what do we do with those
management structures and the people who have been working within
them. We also realize, from what I understood from your ques-
tion, that those people can't just take on that job without
training, just as industry can't take on those simulators without
having the ability to get trained people competent. We will do
our part, too.

Comment

That helps a lot, sir. I understand that you have an existing
skill that will do that job for you.

Captain Scott

Yes. As we go into this new iteration a little bit, though,
we will need to retrain those people somewhat in establishing
the teams.

Comment

I understand that. Might I just ask, then, how many do you expect you would need for a typical site?

Mr. Johnson

It depends on what trainers we're talking about, how complex, what the material condition is, how many contractors we've got on each particular site. At Oceana, we've got A-6s, F-4s, F-14s; at Norfolk, we've got another mix of aircraft; Fred, out at Miramar has got E-2s, F-14s, so he's got a lot there. Every base is the same mixed bag, and again, who made the simulators, who wins the contracts.

Captain Scott

Let me add a little bit on that. I think the gentleman is hedging on something. For a number of years when we're in the contracting business, the inspection provision of quality assurance is where we're trying to get -- now I understand protecting the Government's interests, but we're trying to do that by placing that responsibility on the contractor and the QARs, as the old maintenance man back here brought up a while ago. We have that criteria and there will be a form of this contract and they'll be spelled out when and what time, etc., to assure that that performance is being met.

Captain Ryan

I'd like to throw something out here too. I agree with Captain Scott that there are too many people involved in trying to administer contracts. We solved that at NAESU. I have 2,000 people all over the world and I don't have the first contract out of my building in Philadelphia. I don't have the first technically-based or contractual expert out in the field. Not one. And I don't have a problem executing the contract.

Question

Captain, are you looking at or are there any plans to go beyond simulator maintenance . . . .

Captain Scott

No, because of two things. At this time, the affordability of the maintenance trainers; second, the maintenance trainers have been maintained extremely well, I think. Plus the fact, the organic Navy support for the maintenance trainers is from a different group of people, not TDs, and therefore, we don't anticipate at this time, at least, going to anything other than air crew aviation simulators. Not general test equipment and that kind of stuff. That's all being done fairly well. There are some little

pertubations in there that we're working on on individual cases. Any other questions?

Question

We talked about having to use organic Navy support at the present time. This means that that puts us automatically into the ASO loop, right? Downstream, though, further on on your slide, you mentioned it was going to be 100 percent total contractor support.

Captain Scott

As long as you understand that that's for trainer peculiar components and parts.

Comment

That's what I'm driving at. We have a supply code called 8N. An 8N supply code -- right now, it's a very difficult problem for the Navy to solve. For anybody who doesn't understand what that is, that's a piece of aircraft equipment that in order to be put in the simulator had to be modified. That automatically takes it out of the Navy's capability at the I level. That means you cannot take it and put it in AMD and have it fixed because it doesn't match the aircraft. ASO, then, has contracts with various and sundry people to maintain that 8N coded item. There has been a problem for 25 years that I know of because those contractors will not accept a single item for repair. You must have maybe up to six or seven or maybe a dozen before they turn on their repair lines, so that means you must have a half dozen trainers down before you can get your part fixed. This puts the contractor, then, in a bad light.

Panel Member

I don't think so.

Captain Scott

I think if you'll go back to the selection of words I used, I basically answered all that you just iterated by saying that anything other than aircraft common parts, that definition says that it will either work in the airplane or it will work in the simulator. If it won't work in the airplane, it's not aircraft common and therefore it's trainer peculiar, and if it's trainer peculiar, we're going to take what we've got, we're going to put it in whatever condition it is, and we're going to say, here, Mr. Contractor, is the support package. We haven't found that contractors have any difficulty getting them replenished, repaired, or whatever. As a result, we know those packages are incomplete on many of our trainers today. We hope to complete that

package. Once we do, it will be pulled out of the supply system and that will then be part of your responsibility, as I said, in the repair, in the logistics support, in the technical data, that you keep it updated, that the next competitor who comes along can beat you out of the contract, knows exactly what he's got, too, and exactly what its status is, and it keeps on going. We covered all the concerns that you very well understand and I think we understand them and have got a pretty good program for dealing with them. I go back, though, to one other thing I said. You, Mr. Contractor, have got to work intensely with us to take care of all the up front effort required to deal with those existing trainers out there. For the emerging systems, we know what we're going to have and that's pretty well defined. For the future systems, we will do a lot better. We will meet our overall objectives. Thank you.

Captain McHugh is giving me a signal.

Ladies and gentlemen, I hope that you have enjoyed this panel session as much as I have. I've been very intensely involved with it, along with many others over the past year, and this is our opportunity to really mix it up with you such that you understand as much as we can tell you, so that we can become that team that I said was essential. There are still many issues that you don't go home with all the answers on. You know the key players -- Commander Ron Smith, Ed Baker, Johnny Johnson, myself, Captain McHugh -- and don't forget these gentlemen, the users, Captain Meyers and he's got a counterpart in AIRLANT, along with the Naval Reserve, and the Marine Corps, in some cases. Then there's the whole Training Command. Those are all the prime users. They're going to have some answers for you; we will have answers for you. We will continue to work the problems. We know there is a lot that we don't have specific, defined answers for.

I thank you. I particularly thank this panel. I asked them to join me. I selected them pretty arbitrarily, but I think it served a very useful purpose. I got them from one end of the spectrum to the other. We've met for a few minutes over the past couple of days, gotten to know each other a little bit. They enhanced my ability to project to you some of the issues. I think they did well, and I appreciate it very much.

To Captain McHugh and the whole industry, we thank you for the opportunity.

INTERSERVICE/INDUSTRY

EXECUTIVE PANEL REPORT

Captain J. T. McHugh

In the course of running the Interservice/Industry Conference, we've come up with a very specific system to get some productive things done, and part of that system is to preface the actual conference with one day that includes an executive session. That executive session includes myself, the Program Manager for Training Devices, SIMSPO from Dayton, Ohio, Colonel Castellana from the Marine Corps, and then about 15 VPs from industry, at which time we bring up a series of subjects in which we hope we can gain some mutual interest, and try to get some actions that both industry and government can work in concert with for the next year and try to get something productive done for the benefit of both.

This year we had several subjects to cover. We picked five in particular. One was the IR&D program, where it was going within simulating devices in industry and government. The next was the COMS program. We won't summarize that because I think it's been extremely well summarized in the last session. In addition, we were looking at where we might be going in modular electronic gear and modular equipment, which the SIMSPO brought into the subject. The third area we were interested in is the status of GFE and COE within the training device community. The last subject was supply support and what direction we might be going in supply support. What I'd like to do at this point is to have each of the committee members summarize those subjects, briefly touch on them and then at the conclusion of that we'll have some administrative remarks and we'll have a session for questions and answers.

We'll start off with the IR&D effort. Dave Glenn, my director for Research and Development at NTEC, will give you a real quick summary of what we discussed in the IR&D area and what actions came out of it.

Mr. David Glenn

Actually, there is about $3 billion a year estimated to be spent by industry in the R&D area. Of that, about $1 billion is reimbursed through the IR&D process. Recently there has been a great deal of emphasis out of DOD on this IR&D area. There is a feeling that we need to monitor progress in the program better and to provide more review and guidance to the contractor community in the R&D. The objectives, of course, are to influence the contracting community to work on projects which the Government thinks are high priority, to avoid duplication between the Government and industry R&D programs, and to actually just communicate results back and forth.

There were a number of points made during the committee meeting. I'll try to summarize those very briefly. Everyone agreed that there needs to be more communication back and forth between government and industry in this particular area. There was a feeling among the contractor community that the Government can improve the quality of the evaluations that we provide, as far as this process. This can be done by making sure that the people who evaluate the industry programs are qualified and that they do their homework prior to the time that they evaluate the program. It was also emphasized that it is extremely important that the Government evaluators write down comments for the contractor community so that there is no question about what was meant by the evaluation.

There was also a suggestion that government needs to pass more information to industry regarding the R&D efforts of the Government community. This is being done in some instances. The Navy has published a Navy needs document which is classified. Many of the labs are actually passing out summaries of their R&D programs and it was encouraged that this continue and that we see more of this.

Finally, there was a caution given that the Government evaluators still need to be very careful about passing out information to other contractors of a proprietary nature. I think that's always something that we have to be careful of.

There was only one action item that came out of this discussion and that was for us to distribute to the industry representatives a summary of the principal evaluators as a function of companies, so they would know who is supposed to be doing what in the evaluation of R&D.

Captain McHugh

Thank you, Dave. The next subject was a modular approach to training devices and Colonel Tom Honeywill will cover that subject.

Colonel Thomas W. Honeywill

The modular concept is a SIMSPO initiative to examine the feasibility of standardizing interfaces between the packages or modules or subsystems in a similar area, both hardware and software, similar to the fairly successful MATE program that the Air Force has kicked off -- MATE being Modulized Automatic Test Equipment. I think the benefits, if feasible and doable, are clear in reducing costs and development time. We hope to expand it to a joint Service or interservice effort in the future. I don't think we're quite there yet, but I'd like to introduce my Director of Engineering for SIMSPO, Art Doty, who will give you a brief summary of the pitch we gave at the Executive Session.

Mr. Arthur Doty

The Colonel has almost shot my briefing, but we'll press on a little bit. To plunge right into it, that's the definition. That's our working definition. We can read that as we go. The essence of it is that we don't propose to get into the guts of the modules with you. We would like to achieve the advantages by specifying and holding to standard interfaces, standard busses, perhaps, and a possibility exists that we want to go to a standard instruction set.

This is just a list to give you an idea of what the thought pattern is, the likely modules. The instrument one is especially attractive to me. Mr. Seidensticker gave a paper yesterday in which he talked about creating the instruments as standard modules, totally contained within themselves. All they would need would be commands from the primary computer. That's the way we want to go. If you make those standard, a guy could design an instrument with the assurance that it could be used anywhere. I think the advantages are pretty obvious. If we can reuse modules, hardware or software, we gain advantages in cost and I think you know that right along with that goes time. Our support costs will go down, we can reuse test equipment, we'll have understanding built into our people. It should increase the competitive base. If you're confident that when you build a subsystem to known interfaces it will work and we'll stick to that, we would hope that that would encourage you.

The approach is pretty simple. In the near future we will be out to industry with requests for information and I really stress that that's very important. Before we do anything contractually, we need to get your ideas. Is this thing really a good idea? Will we really save money? Is it going to have too much impact on technology? We need your ideas on how to proceed. With that, we plan to go straight away into a developmental, contractual effort with two contractors to pin it down -- how should we really do it, what are the specs and standards we need to run a real modularity development contract, what are the costs, what are the real advantages, and perhaps what are the real disadvantages. With that information, if it looks really good and can stand up to a good technical, economic, and support analysis, we will go into a contract to actually develop the tools, the standards, and we will, on that same contract, validate that they work. The sequence of events -- we hope to get a contract in 83 for the study and in 85 for the actual development.

Captain McHugh

Thank you, Tom and Art. The third subject we covered will be reported by Hank Okraski, who is my Director of Engineers. He'll cover the subject of a problem that I think is common across all Services, the problem we have with GFE and COAE.

Mr. H. Okraski

I think that yesterday during the user panels one thing came through loud and clear. That is that the user is looking for more supportable, reliable training equipment and he is also looking for training equipment that is delivered either prior to or concurrently with with weapon system. The Achilles heel in this whole process, and the obstacle that we've all got to face up to, is the lack of timely delivery of GFE and government furnished information. We addressed this in our discussions on Monday, hoping that we might find some solutions or at least some way in which we might be able to approach the problem a little better. What emerged quite rapidly was the need for an up front analysis, a very thorough up front analysis, as to whether simulation or stimulation should be used. Some of the factors that need to be considered very early are performance of the simulated item versus the stimulated item, the cost, the lead time, the availability, the reliability, supportability, life cycle costs, and also, as it was brought out, I believe, in the previous panel, whether or not we're talking about a high change activity weapon system. In those cases, we want to make sure that we do use the operational computer, the onboard computer that can simply accept new tapes as changes are made to the weapon system. Also, I believe our brother Service, the Army, pointed out that it is necessary to consider user acceptability. In many cases, non-look-alike items are not readily accepted by the user. In any event, all of these things must be brought together through an up front analysis.

One of the problems in GFE delivery is, I think, quite common to anything that the Government gets into where they become a doer. Whether it be delivering the mail or delivering GFE, I think there are similar problems, and that is when the GFE items are identified very early in the POM process, they may take a different track than do the training devices themselves in the budget process. To bring them together requires about the same skill as a high wire acrobatic act, whereby if one fails to catch the other, then there we go and the contractor is into an over-run or a mis-schedule situation.

We pointed out that we have the necessary data bases and information systems to help track our GFE, but unless they are ordered properly and unless budgeting is done properly and perhaps even . . . for trainer items, we stand a good chance of not meeting the delivery schedules. At one time we decided we would transfer this risk over to the contractor and in some cases we still do, in that we require him to provide these equipments as contractor acquired operational equipment. By transferring this risk to the contractor, we found that we have been faced with things like cost acceleration, over-ordering. The availability of the items determines the technical approach that is to be taken and we experienced supportability difficulties. In fact, some of those difficulties that were mentioned in an earlier panel

follow through in this situation. I won't go into the reasons as to why GFE is late. We enumerated those. A point was also made, and I believe it was made in the earlier panel, that aircraft manufacturers don't necessarily experience the same difficulty when they are the trainer manufacturers. That's something that I think is probably a given.

The proposed solutions that emerged follow along these lines. We feel that the budget for GFE should be identified very early and if possible, the black boxes should be procured with the aircraft items simutaneously. We also feel that the baseline for trainers should be established very early in the game and held at that position until the GFE in the system is developed. There's nothing more time-consuming and cost-comsuming than to try to chase a baseline of a new aircraft down the runway, trying to keep up with it on a delivery schedule. We think that training devices, of course, should have a higher priority and by the way, there is an OPNAV Instruction that deals with the priority of GFE for training equipment. It's OPNAV 4490.2B. Perhaps we can get some exercise out of it.

We also thought that by providing redundant GFE to contractors, that is, maybe two sets of an item, might help to cut down the development time and also provide a spare for anticipated failures that might occur during the development phase.

One of the bigger problems that we have with GFE, besides the delivery, is the fact that we can't keep it up once the developer has it. Although there are provisions in the contract for repair of GFE, normally with today's high cost items, we rapidly exceed those limitations of the contract and find ourselves with no support for those items.

All in all, we have some difficulties. We think we have some solutions. There are no magic cures, I believe, for solving the timely delivery problem. We think that this might be a good item for NSIA and the other Services to continue to pursue over the course of the year and see what we can do to alleviate the situation.

Captain McHugh

Thank you, Hank. . . . . . . difficulties in that area. Lieutenant Commander Walkovik will cover that subject.

Lieutenant Commander G. L. Walkovik

Supply support for simulators is almost a misnomer. It should be supply non-support. The Navy supply system has a difficult time supporting simulators, primarily for two factors: first there is a difference in the length of the acquisition cycle between aircraft and simulators. The acquisition cycle for simulators is roughly one-third that of aircraft and the

Navy supply system continues along at the same pace. Therefore, simulators are delivered and supply system support comes along roughly three years thereafter. Secondly, simulators are bought in very small quantities with very high reliability factors of the components. When those are plugged into the supply system computer, which has an optimization provision, the resulting supply system stock is non-existent. We don't have enough to warrant spares.

In trying to provide a system that is workable with the high availability needed by simulators, we're trying to come up with a little bit different system to provide for supply support upon device delivery. In breaking it down, simulators have roughly three categories of material. Number one, they are composed of commercial computers and peripherals. There is no reason why we can't share the cost of inventory and services with other commercial customers. Therefore, we are going to provision commercial computers with one set of boards which would allow for fault isolation to the board level and thereby use the computer manufacturer or another vendor in the area to provide the same type of services as to any other commercial customer.

The second category of material is GFE, which Hank discussed. Due to the nature of GFE, GFE would have to be continued through the Navy supply system as it is presently today.

That leads us to the third component, which are the trainer unique or trainer peculiar parts. If we are to enhance training device availability through supply support, we will have to buy . . . . of these types bought during production of the device. Second, we would like to have centralized management to give us visibility of all these parts, whereby if one device on the east coast comes down, we would have the capability to move the required part from the west coast to the east coast. Third, we would like to do advance contracting for repair of depot level repairables. This would save us a great deal of the time and consternation we're running into today where we're waiting for sufficient demand or where the device is old enough so that we cannot find someone who will repair it at the depot level.

Captain McHugh

That was a very quick scan of the subjects we covered in the Executive Session. There are no outstanding actions that were really left, other than the few that were covered. I've included on the panel up here Gary Morton, my Technical Director, and Bill Turner from Singer-Link, and Bill Eager from Grumman, and also Colonel Campbell is up here to answer any questions you might have regarding the Executive Session. If there are any questions, they're ready to field them right now.

I think this session has been exceptionally well handled and I certainly have enjoyed it and am very proud to see the

people we got here and the way it progressed. Of course, a lot
of people deserve a lot of good accolades, particularly NSIA and
Paul Watson back there, Bobby Layne and Jim Gardner. Obviously,
a lot of people deserve a lot of special credit and I'm going to
invite Jim Gardner up here now to make the final comments for
the NSIA.

Dr. Gardner

First of all, I would like to thank the Executive Committee,
especially Captain McHugh, for giving us the guidance and the
direction of the conference; Colonel Castellana for providing
excellent Marine Corps direction; Colonel Honeywill and Colonel
Campbell. I'd also like to recognize the exceptional job done
by Mr. Tom McNaney, who was Chairman of the Interservice Steering
Committee. I can't begin to describe the amount of work that's
been done by that man in the past year. All I can say is, when
you go to his office, I understand Captain McHugh has now padded
the walls there. He has done an admirable job. Also, Lieuten-
ant Colonel Fairfield has been, I would say, what you would
think of as the exemplary Marine. When you think of a Marine,
he is all that I think of that stands for a Marine. He's an
exceptional worker, he's dedicated, committed, and so very, very
capable.

I'd also like to recognize Mr. Marty Morganlander, the
Chairman of the Exhibits Committee. Marty is the fellow, if you
don't know him, he's the guy who kept running into your elbows
with his face. He's built low to the ground and they say he's
build low to the ground, built low for speed. But frankly,
those of us who have worked with him over the past year feel
like he's one of the tallest men we've ever met.

I'd also like to note the job done by Mr. Ken Kilner on the
facilities. Ken and his twin -- you probably noticed the twins.
They look alike, but I know darn well, and many of us have agreed
on this, that no one guy could be in all four of these rooms at
one given time. He's been watching over the facilities through-
out the conference and no guy could move like that, so we've
decided there have to be twins out there.

Others that have contributed so much -- Ralph Davis. Now,
Ralph Davis, the Chairman of the Program Committee, has frankly
given me some problems. In the middle of the night, I'd wake
up, think of a little detail, and in the morning I'd call him
on the phone and that son of a gun had already taken care of it
about two weeks before. I never, ever got ahead of him. Very
irritating.

Others -- Bill Herzog assisted so much with the committee.
Vic Faconti, in charge of Communications Committee, which was
sort of a potpourri of many activities, including publishing
the documents. You know, you put an organization together and

you have assigned tasks, and you always forget about half the tasks. Vic was the man that stood up, filled the hole, and walked in when we needed the assistance so badly, and it wasn't his responsibility; he just took the responsibility and did the job.

Others -- Bob Witsil, head of the Facilities Committee; Jim Zullo made all of the publicity arrangements, along with Allen Collier from NTEC; Jack Gifford, the Registration Committee -- always there when we needed him. He lived out in that computer area, along with Vic Faconti, along with those hot computers. Rod Rougelot, the Chairman of the Technical Committee, so ably handled the technical responsibilities and it seemed like every other day he was writing a letter to some session author.

Others -- Joe Andreani, the Chairman of the Management Sub-committee, and Jack Bockas, the Chairman of the User Subcommittee. A few others -- Rear Admiral Oberg selected and invited the speakers and I think we owe him a debt of gratitude for the ex-cellent speakers we've had here in the various plenary sessions. Lieutenant Norman, running from room to room to room handling the protocol -- that poor guy, I don't know how he's still standing. Jim Bishop -- working so hard trying to handle many of the details on the facilities and coordinating many of the Navy affairs and the office activities upstairs.

Just a couple of others I might mention -- Jim Gaspar, who has been coordinating the video taping of this conference for a documentary which will be available to all of you in a couple of months. He has led a group of individuals you've seen throughout the hotel here -- a very difficult task and if you saw him yesterday morning, he was hanging off the side of a helicopter taking aerial shots, so that took a lot of nerve. I also want to thank SEL Gould for providing the registration materials in the central lobby of the hotel. That was no small task. That took an entire year to put that package together and it assisted greatly in our registration at the conference.

Finally, I'd like to thank the various companies and organi-zations that have sponsored those that have been involved in the various committees. You know, this has not been inexpensive to handle all the meetings, the travel, the support expenses to handle a conference like this. I think those companies are to be thanked and commended for their interest and cooperation.

Another group that we often forget to thank are the wives. We all get to come here and bask in the sun down here, but they're back home and they've worked pretty hard assisting us. So let's not forget the wives back home.

Finally, I want to thank the Navy -- NTEC and the Navy at large -- for the coordination they've done on this conference. I think it's been exceptional. You'll see that in retrospect

in a couple of months when you have a chance to look at the
video tapes of the conference and reflect again on the exception-
al guidance that has been provided by the Navy.

Thank you.

Captain McHugh

We don't have too many more people to thank, but I think I'd
like to invite Tom McNaney up here. Tom probably has a few more
words.

Mr. Thomas W. McNaney

Thank you, Captain. I'll make mine short. It's been a long
year, a long three days, and I think I'm about to crash. But I
want to take the opportunity to thank the support I had this
week from all the ladies from NTEC, PM TRADE, who did all those
things behind the scenes. In particular, there are two ladies
I would like to give an extra special thanks to. One, I am
probably fortunate in having one of the best secretaries that
the Center and the Navy has, and Ruth, I'd like you to take a
stand. Believe me, I couldn't have done it without Ruth. The
other one I don't see here, but that's my wife. Believe me,
it's been a long year and she put up with an awful lot from
me and I'd like to thank her even though she's not here.

Thank you all.

Captain McHugh

I'd like to thank a couple more ladies -- I see Dottie and
Marion and Brenda down here. They kept the communications cen-
ter going and kept us all squared away. Also, Charlie Davis,
who kept the cars moving and the VIPs coming and going. It's
been a very interesting three days for me. I'm glad we finally
stopped for a couple of minutes.

The session, I think, turned out beautifully. We stressed
the user -- that's what training devices are all about, getting
them to the guy who needs them and making sure that they'll do
the job for them. We couldn't have picked a better subject to
concentrate on and certainly the speakers that we had at the
luncheon and dinner concentrated on those areas. The speaker
list was absolutely superb. You couldn't ask for anything
better.

I guess this is a very happy time for me because this is a
time when I get a chance to pass the wand. The next guy gets
to step up here -- and of course you know, the industry confer-
ence is interservice conference. It's rotated through the three
Services -- the Army had it last year here in Orlando, and we
had it again here in Orlando. Colonel Tom Honeywill, along with

John Todd, have the wand for next year. So Tom, I'll turn it over to you and let you make any statements you'd like to make regarding it and then we'll follow up with some last administrative comments.

Colonel T. W. Honeywill

. . . . . I must say that I was overwhelmed by the scope, the degree of planning, and the smooth execution. It's going to be a very tough act to follow, but we accept the challenge and we're going to move out to meet it. The sponsor next year will be the American Defense Preparedness Association, the Executive of the Association being Nelson Jackson. As you probably all know, the 1983 conference will be held in Washington, from the 14th through the 16th of November at the Washington Hilton. I believe the 1983 conference will provide us with a unique opportunity, a unique opportunity to the training community, to present its story and its programs and its equipment in a forum where we may not just be preaching to ourselves alone.

I look forward to it and I'd like to introduce John Todd and let him add a few words, as well.

Mr. John Todd

I'm going to bring this mike up, since I'm a little taller than Jim. Jim didn't mention it, and I don't know how many of you have known Jim for a period of time, but when this conference started last year and he started planning, he was as tall as I am. It goes to show you what happens after one year.

Seriously, on behalf of the American Defense Preparedness Association and our industry, your conference committee for 1983 invites you to participate with us in Washington for the next year's conference. Tom mentioned the Washington Hilton, but he didn't mention that this is the hotel that gained some notoriety during President Reagan's attempted assassination last year. We guarantee you that if you join us, we will not have you shot at at the front entrance.

Ladies and gentlemen, someone has said that progress is making a great thing better. We, as Colonel Honeywill indicated, have observed this conference and been a part of watching it performed, being put on, and we intend to do our very best to see that both industry and the Services have the opportunity to make this conference even better in 1983. We welcome your support, look forward to your assistance, and will see you in Washington in 1983.

Dr. Gardner

With that, ladies and gentlemen, I declare the conference concluded. Thank you very much.

FOURTH INTERSERVICE/INDUSTRY TRAINING EQUIPMENT CONFERENCE
HYATT-ORLANDO, KISSIMMEE FLORIDA
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